

Class TR 890  
Book .M65



# Scanned from the collections of The Library of Congress



Packard Campus  
for Audio Visual Conservation  
[www.loc.gov/avconservation](http://www.loc.gov/avconservation)

Motion Picture and Television Reading Room  
[www.loc.gov/rr/mopic](http://www.loc.gov/rr/mopic)

Recorded Sound Reference Center  
[www.loc.gov/rr/record](http://www.loc.gov/rr/record)







# MOTION PICTURE PROJECTIONIST

(Fourth Year of Publication)

ILEX F:2.5

DUAL FOCUS

**W**HETHER you run sound-on-film or sound-on-disc, the Ilex Dual Focus Lens retains the same size screen covering and the same clean-cut brilliant pictures for either type of film.

**A** SHIFT of the lever adapts it for any type of film and brings the picture into sharp focus in either position.

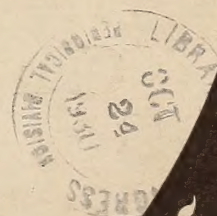


**W**HEN ordering give make of projection machine, size of screen and length of throw from projector to screen.

SOUND ON FILM  
SILENT OR DISC

ILEX OPTICAL COMPANY  
ROCHESTER NEW YORK

ESTABLISHED 1910



A MANCALL  
PUBLICATION

NOVEMBER, 1930

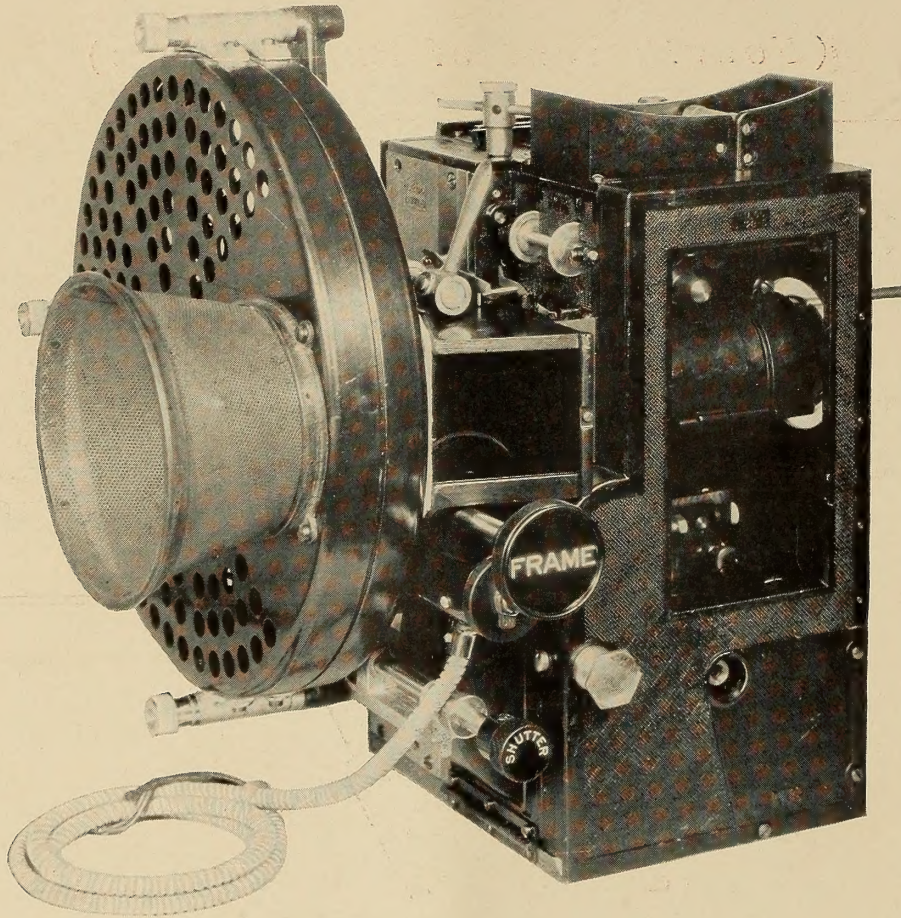
Vol. 4, No. 1  
25c. per copy  
\$2.00 per year



*Now Ready!*

TR890  
M65

# KAPLAN REAR SHUTTER



Can be Attached to Any Sure-Fit  
or Simplex Mechanism

*See your local dealer or write to us*

Sam Kaplan Manufacturing and Supply Company, Inc.

729 Seventh Avenue

New York City

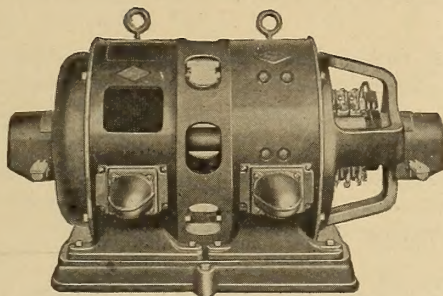
35-23118



# IMPERIAL M-G SETS QUALITY ASSURES PROJECTION

**1 QUIET  
OPERATION**

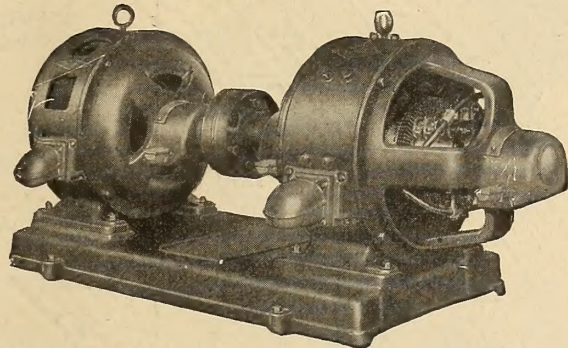
**2 OVERLOAD  
CAPACITY**



*for Small Theatres*

**4 RELIABILITY**

**3 CONSTANT  
VOLTAGE**



*for Large Theatres*

## OUR BUSINESS CREED

**1 QUALITY**

**2 SERVICE**

**3 RIGHT  
PRICES**

**4 COURTEOUS  
TREATMENT**

Never before has the public been as "picture" conscious as they are today. This applies to Quality of Projection as well as to type of picture.

Imperial Motor Generator sets are especially designed for Projection work and have built into them features that enable you to obtain the type of Projection necessary to satisfy a discriminating and "picture" conscious audience.

*Consult Your Dealer or Write Us.*

# THE IMPERIAL ELECTRIC CO.

*Established 1889*

**AKRON**

*Branches in Principal Cities*

**OHIO**

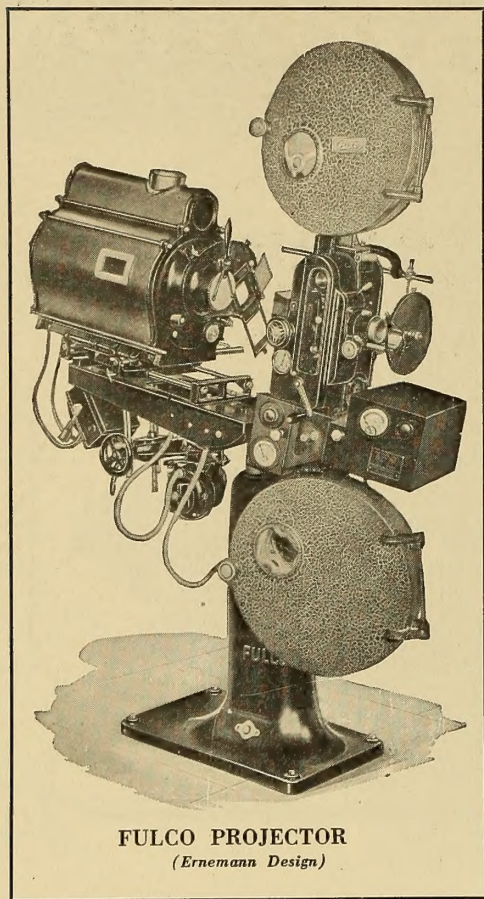


---

**WORLD'S BEST THEATRE EQUIPMENT**


---

# Tomorrow's Projector *is here* Today!



**FULCO PROJECTOR**  
(Ernemann Design)

On demonstration at all E. E. Fulton Company  
branch offices located in the following cities:

CHICAGO .....1018 So. Wabash Ave.  
NEW YORK .....115 W. 45th St.  
BOSTON .....65 Broadway  
PHILADELPHIA .....1337 Vine St.  
ATLANTA .....146 Walton St.  
LOS ANGELES .....Film Exchange Bldg.  
ST. LOUIS .....3232 Olive St.  
MILWAUKEE .....151 Seventh St.  
INDIANAPOLIS .....340 No. Illinois St.  
SAN FRANCISCO ...255 Golden Gate Ave.

**T**wo years ago Fulco was brought to the showmen of the world.

**T**oday it stands established as the most efficient picture machine the world has produced.

**T**omorrow it will dominate even more completely. Why? The record answers that question. And here's the record.

**F**ulco, costing no more for initial outlay, costs less to maintain. Automatic lubrication, oversize working parts, dust-tight housing, reduce friction and wear.

**F**ulco, designed for the age of improved projection, gives better screen results—steadier picture and better sound, because it can't vibrate and won't develop noise.

**F**ulco, built to carry moist air cooling at aperture, permits use of increasing light intensities necessary for the show effects of the future.

**F**ulco, providing accessibility of working parts and instant replacement of intermittent, sprocket, and tension shoes, insures the life of your show.

**O**nly by comparison—point by point—with other projectors is Fulco's superiority fully revealed.

**I**f you are fed up with paying out box office profits for repair and replacement-parts bills on machines of antiquated design, for the sake of your bank roll and your reputation as a showman make this comparison.

**T**here is no obligation in calling on our representative for a demonstration.

## E. E. FULTON COMPANY

C. H. FULTON  
President

A. G. JARMIN  
Treasurer

Executive Offices: 1018 So. Wabash Ave., Chicago

Factory: 2001 So. California Ave., Chicago




---

**E. E. FULTON COMPANY, COAST to COAST DISTRIBUTORS**

---



# MOTION PICTURE PROJECTIONIST

November, 1930

Vol. 4, No. 1

JAMES J. FINN, Editor

Lester Isaac, *Efficiency*; J. H. Kurlander, *Light*; Arthur Gray, *Conservation*; John Kieley, *Equipment*; Samuel Wein, *Research*; R. H. McCullough, *Sound Projection*; Harry Rubin, *Improvement*; Victor Welman, *Personnel*; Sidney Burton, *Production*.

Published monthly by Mancall Publishing Corp., 45 West 45th St., New York City. Subscription rates in U. S. and Canada: twenty-five cents per copy; two dollars per year; three dollars for two years. Add one dollar for foreign postage. Changes of address should be submitted three weeks in advance of publication date to insure receipt of current issue.

Entered as second class matter Oct. 25, 1927, at Post Office, New York, N. Y., under the act of March 3, 1879.

## Canadian Representative

H. N. Elliott, Suite 11, 27 Sherwood Ave., Toronto, Canada.

## Australian Representative

McGill's Agency  
179 and 218 Elizabeth St.  
Melbourne, Australia

## Editorial & Advertising Office

45 West 45th St.  
New York City



## 65 mm. Film Size Desirable, Says Publix Technician

Dr. N. M. La Porte, director of research for Paramount-Publix, recently had some interesting things to say relative to the advantages of using 65 mm. film. Dr. La Porte pointed out that 65 mm. film not only supplies an increased angle of vision but greatly increases the sharpness of the picture.

He also explained that the installation of wide screens in several of the Paramount-Publix houses had nothing to do with the advancement of wide film photography, although when wide film productions are released the screens could probably be used for that as well as their present use in relation to the Magnascope. In respect to recent experiments with 65 mm. film Dr. La Porte made the following statement:

### Condemns Excessive Magnification

"In the use of 35 mm. film on an average 24-foot screen, the magnification of the picture is approximately 90,000 to 1. In using the 65 mm. film that we are experimenting



## Make them go out with a smile

NATIONAL PROJECTOR CARBONS burning in your machines will insure a clear, steady light on the screen with no flicker! Pictures that are easy on the eyes will be especially appreciated. Your customers will leave your theater with a smile of contentment. Because National Projector Carbons are controlled and inspected in all stages of manufacture, you can be certain of smooth performance . . . even-burning on increased amperage . . . more light per watt. National Projector Carbons help insure steady patronage by giving your audience the best of every film.

NATIONAL CARBON CO., INC. Carbon Sales Division: Cleveland, Ohio

### BRANCH SALES OFFICES

New York, N. Y. Pittsburgh, Pa. Chicago, Ill. Birmingham, Ala. San Francisco, Cal.

Unit of Union Carbide  and Carbon Corporation

## NATIONAL PROJECTOR CARBONS

## "BEST" Magazine Light



attaches to side of magazine illuminating the inside showing the exact amount of film on reel from either side without opening door.

**BEST DEVICES CO.**  
200 FILM BLDG., CLEVELAND, O.

Price \$3.50 at your dealers





# **AUTOMATIC REFLECTOR ARC LAMPS**

*Silently, Automatically  
Producing—Crisp  
White Light*

FOR SALE BY INDEPENDENT SUPPLY DEALERS

**The Strong Electric Corporation**

2501 LaGrange St., Toledo, Ohio

with on the screen, it will not be enlarged proportionately, but will be held at a maximum of 42 feet, thereby decreasing the magnification to 65,000 to 1. In reducing the magnification the emulsion granules on the film will be invisible and this, plus the concentrated light values imparted to and reflected by a screen proportionately smaller, even if larger in feet and inches, will enhance the clarity and smoothness of the picture.

"The failure of the attempts to magnify 35 mm. film, intended for a 24-foot screen, to a 42-foot picture may be ascribed to the unnaturally magnified picture and the resultant visibility of the granules which gives "fuzziness" to the picture. Another advantage of our 65 mm. film is the greater depth attainable due to the larger field of white, gray, and black color planes that may be contrasted. It is a recognized scientific fact that real third dimensional photography is an impossibility, although a pseudo-third dimensional effect is reached by contrasting light planes through the use of stage lighting. With the improved sharpness of 65 mm. film this effect is naturally heightened."

## **Another Wide Film Process by Coast Technicians**

Development of a wide screen process using standard 35 mm. film and making it unnecessary for the industry to invest about \$250,000,000 in new apparatus, plus some \$10,000,000 yearly on release prints, has been completed by Gilbert Warrenton, prominent Hollywood cameraman, in association with C. Roy Hunter, superintendent of the Universal laboratory.

Advantages of the new method, besides the saving in equipment and prints, are cited as: (1) no change of apparatus needed beyond the reduced aperture-plates used in cameras and projectors, (2) every artistic and technical advantage claimed for wide film is gained, while the optical and production superiority of 35 mm. film is preserved, (3) by use of the bi-pack color processes, wide screen natural color is immediately available, and (4) it is applicable at once to production conditions.

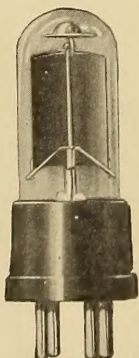
The process calls for the production of a picture of 3 x 6 proportion on standard 35 mm. film, but at all times keeping the main story-telling action in the center of the screen in a 3 x 4 proportion. By doing this it is possible at any time to make an enlarged picture standard size and proportion from this negative without making any other change. Insofar as the photographic apparatus is concerned, the only change required is the substitution of an aperture of reduced height—.360 inch instead of the present standard of .720 inch. When the standard sound track is used, this gives a picture-proportion of 3 x 6.

Concerning

## **PHOTOELECTRIC CELLS**

Higher sensitivity means Lower fader setting  
Lower fader setting means Less background noise  
Less background noise means Better sound  
Better sound means More business

Put VISITRON cells in your machines and  
watch this work out for you.



Type V58-A

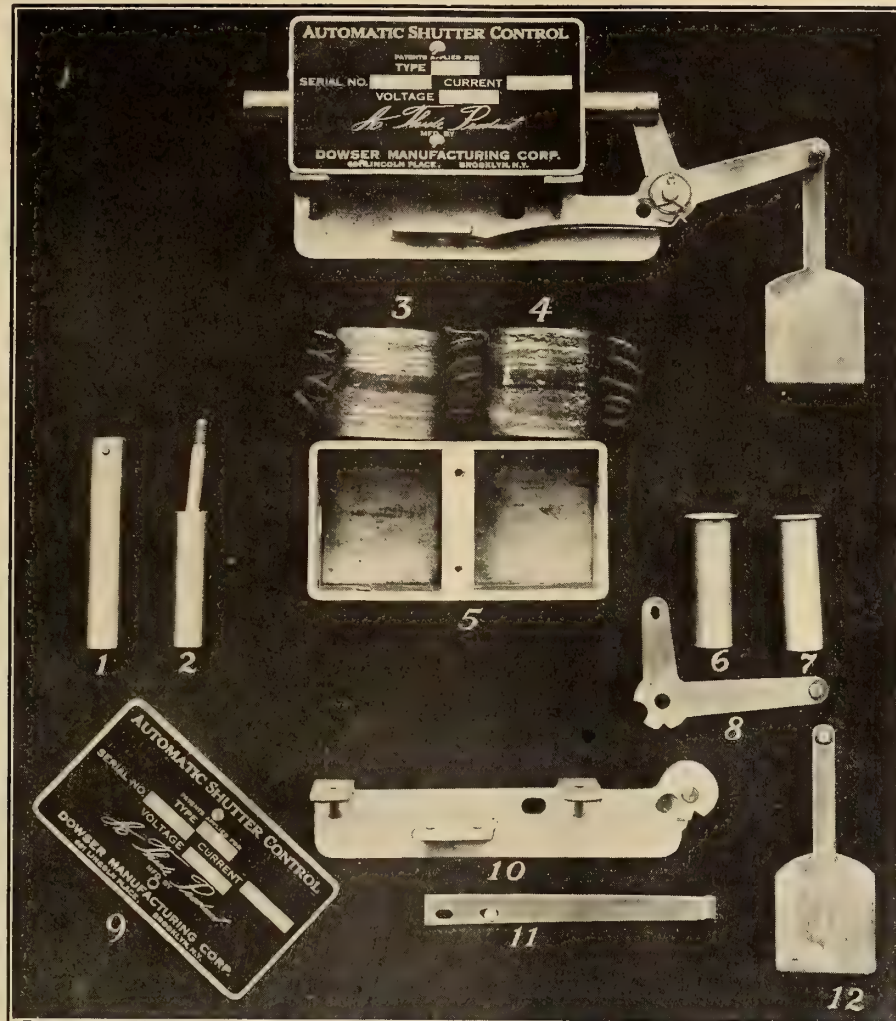
**GM LABORATORIES INC**

1803 GRACE ST.

CHICAGO, ILL.



# The Changeover Adopted as Standard Equipment



1. Armature (Female)
2. Armature (Male)
3. Closing coil
4. Opening coil
5. Housing
6. Armature Sleeve (Female)

7. Armature Sleeve (Male)
8. Bell-crank
9. Nameplate
10. Mounting bracket
11. Shutter spring
12. Shutter

Model D for GRANDEUR, SUPER-SIMPLEX, SIMPLEX, SURE-FIT.  
WITH OR WITHOUT REAR SHUTTER MOUNT  
Model B for MOTIOGRAPH F

“THIDE”

## AUTOMATIC SHUTTER CONTROL

with

### 3-WIRE CIRCUIT FOOT SWITCH

Simplicity for mounting—  
Properly positioned—

Electrically efficient—  
Mechanically proficient

Adoption of the new REAR SHUTTER mount necessitates a change in design for mounting the changeover.

Your (MODEL A.) changeover will be replaced with the new (MODEL D.) with a liberal allowance for the (MODEL A.) Type.

In use by Roxy, Loew, R-K-O, Fox, Warner, Publix, Wilmer & Vincent and others.

Your Dealer or Write

**DOWSER MANUFACTURING CORP.**

691 Lincoln Place

Brooklyn, N. Y.





## For IMPROVED SOUND REPRODUCTION

TODAY the projectionist must meet the demand for improved quality in sound reproduction. Only by periodic tests of the sound equipment can this be achieved. Tubes, amplifiers, horns, batteries, and circuits must be checked at regular intervals to assure continuous and satisfactory performance.

Weston Model 547 is ideally suited for this type of work. It has the refinements in design, the accuracy and dependability in operation, which have caused engineers and maintenance men in all branches of industry to acknowledge Weston instruments as the standard quality in electrical measurement.

Model 547 is a compact, light, portable instrument contained in a rugged Bakelite case with a removable cover. It is convenient, fast, simple and reliable in operation, and tests all types of sound equipment.

This Sound Equipment Test Set has three Weston instruments connected through a system of switches and binding posts so arranged that all required measurements are automatically and quickly obtained on the proper instrument scale without making individual connections.

Weston Model 547 is the modern test set for servicing sound equipment wherever quality reproduction is demanded.

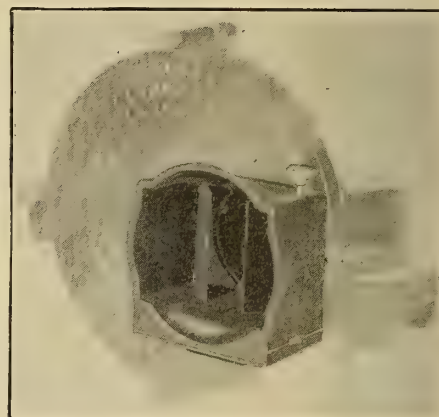
—Write for descriptive, illustrated folder—

**Weston**  
PIONEERS  
SINCE 1888  
**INSTRUMENTS**  
WESTON ELECTRICAL INSTRUMENT CORPORATION  
617 Frelinghuysen Ave. Newark, N. J.

# Zip!

## ~just like that

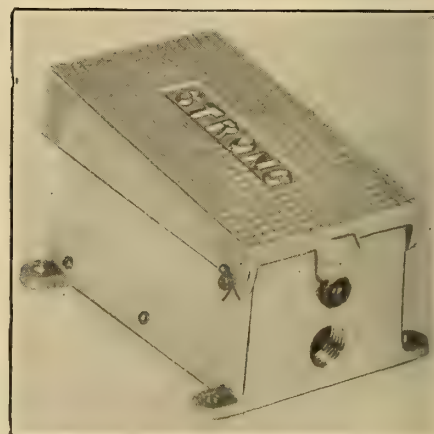
Quicker than the blink of an eye—the NEW SUPER STRONG CHANGE-OVER DEVICE snaps into its job. No noise—no effort—no mis-cues—merely step on the treadle type foot-switch and quick as a flash there's an instantaneous noiseless fade-out and fade-in from one projector to the other.



The SUPER Changeover

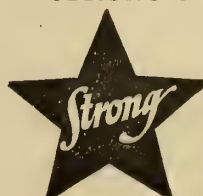
The New Super is the latest newcomer to the famous Strong family of changeovers—developed for use on the new rear-shutter projectors—Simplex, Motiograph, R. C. A. and others. It contains the same mechanism as the famous "FIVE POINT"—which is in reality five distinctive devices in one—changeover, eyeshield, framing light, film gate opener and fire gate finger. THE COILS CAN'T BURN OUT.

The STRONG Footswitch



If your projectors are not equipped with STRONG changeover devices—they should be!

Ask your nearest supply dealer or write to LARRY STRONG of the



**ESSANAY ELECTRIC  
MANUFACTURING CO.**  
2809 W. VAN BUREN ST.—CHICAGO, ILL.



# An Advertisement Every Serious Projectionist Should Read With Care

**T**ELEVISION is just around the corner.

Without question Television is one of the greatest achievements of the human mind; it is also one of the greatest forces for human progress. Like the great inventions that preceded it—the telegraph, the telephone, and radio—it will annihilate space, and make it as inconsequential as a city block.

Ten years ago Television was a faint glimmer which our scientific men discerned in a shadowy world of possibilities. The application of their genius and industry has today made television a fact. People already are able to see each other, although thirty miles apart. The further refinement of the instruments already developed will shortly make the thirty into three thousand, then thirty thousand miles until we, in New York, will be able to see instantaneously others at the extreme farther side of the world.

Industry, of course, will turn Television to its manifold uses at once, as it has done with all inventions. Can it be used for recreational, for entertainment purposes also?

Of course it can—and it will! The great business and industrial institutions of this and other countries that are now backing the development of Television will immediately apply it to the theatre. Millions of homes will be equipped with Television receiving sets, as they now are with radio, and the motion picture theatre will harness it for its own use.

Right now there is a great deal of speculation concerning the nature of the kinship between Television and the motion picture theatre. Some say that it may do away with the theatre—that everything the theatre offers today, music, photoplays, dancing, chorus girls, singing opera stars, musical comedies,—will come straight into the home by means of radio, and Television. Others declare that it will do away with photoplay production—that the story will be acted out before the Televisor and broadcast immediately into the homes and motion picture theatres. Still others—and there are eminent authorities of the theatre and scientific world among these—state that nothing will be changed, that Television will simply help the theatre to further amuse its patrons, just as *sound* pictures have done. It will not hurt the theatre, but help it.

There is no doubt whatsoever that the motion picture theatre will continue to exist—and will turn Television to its own uses. Roxy, master showman of all time, has declared publicly that he is waiting impatiently for the perfection of Television, that he will at once harness it to his showmanship genius and apply it in the Roxy Theatre. Other magnates are even today making provision for Television equipment in their new movie hippodromes.



By  
THOMAS J. BENSON

There has been talk already of the exact application of Television to the theatres. Dr. Lee De Forest, a man of science and of vision, thinks that Television will become a monopoly of the telephone companies; that these will supply and install the necessary equipment for public and private uses, as they now do the telephone instrument; that they will supply entertainment via Television, the same way they now make telephone connections, that is, by request of the renter of the equipment, and will charge them accordingly. Dr. De Forest has even declared that these charges will be added to renter's monthly telephone bill. The theatre will make use of it this way.

Perhaps this is the way it will be done. Why not?

Another question concerns the nature of the equipment which theatres will use for Television. That question cannot be answered now. It may become part of the equipment now in use in the motion picture theatre projection room; it may be necessary to place it on the stage and project on the screen from the rear—it may be one or both of these processes. But this is certain—theatres will need new equipment for Television and smart men to operate it.

*Boone Manacall*

---

Order a copy of **TELEVISION** today—price \$3.50. **SOUND PROJECTION** (\$6.00).

The price is \$8.00 for the two books. Order from the **MOTION PICTURE**

**PROJECTIONIST, 45 W. 45th St., N. Y. C.**



---

# SIMPLEX REAR SHUTTER

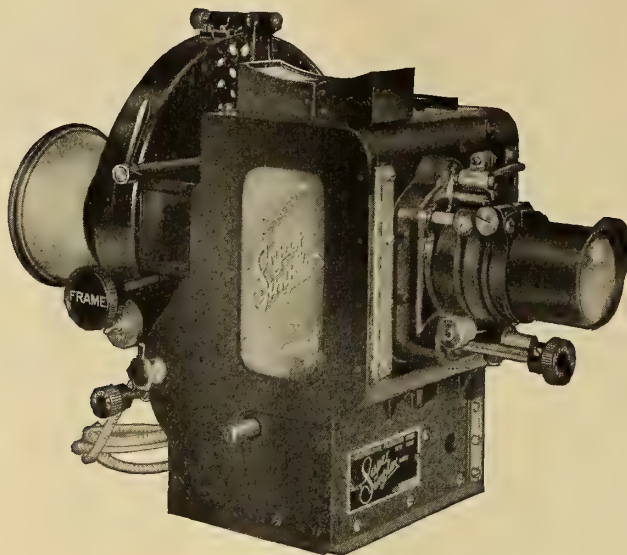
A REVOLUTIONARY IMPROVEMENT

Illumination Increased 35 to 48%

Heat Reduced 50 to 75%

Every Owner, Manager and Projectionist Should Send for Information Regarding

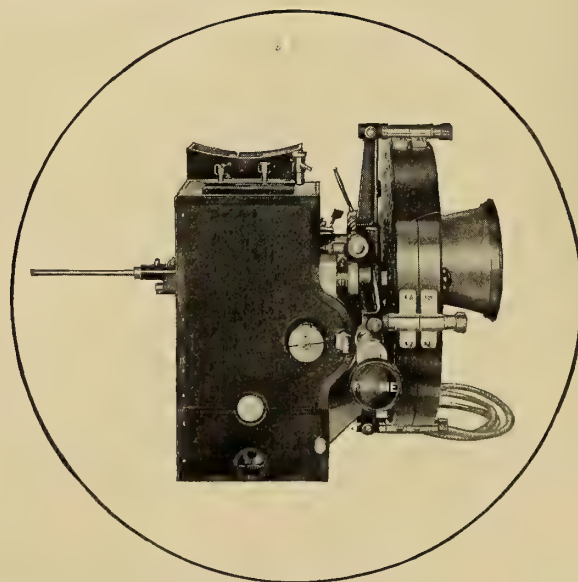
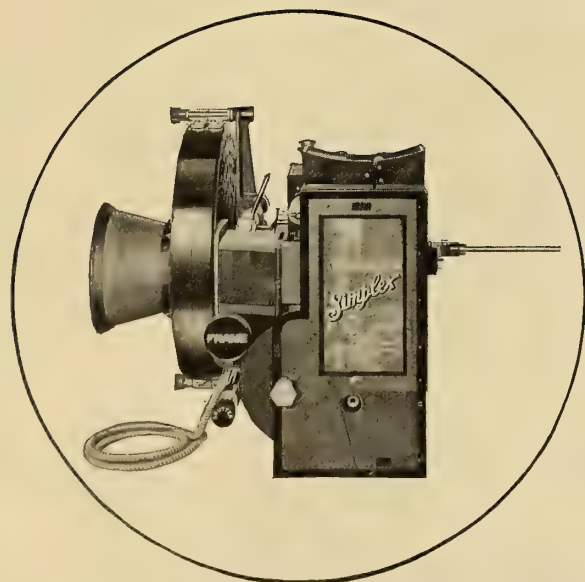
*The new Super Simplex*



AND THE

## NEW REAR SHUTTER ATTACHMENT

For SIMPLEX REGULAR PROJECTOR



SIMPLEX REAR SHUTTER PREVENTS BUCKLING

**INTERNATIONAL PROJECTOR CORPORATION**

90 GOLD STREET

NEW YORK

---



# S. M. P. E. Fall Meeting Program

**W**ITH an unusually varied program assured by the revised reports of the chairmen of the various committees, the forthcoming Fall Meeting of the Society of Motion Picture Engineers at the Pennsylvania Hotel, New York, October 20-23, inclusive, promises to set a standard for all future conventions of this organization. A glance at the list of papers scheduled to be read at the meeting assures the technically-minded motion picture worker of four days well-spent on this score alone. But there are other activities of the meeting which will appeal to all those who attend, first and most important of which is the interchange of opinion and experience in informal discussion the results of which are reflected in future progress in the arts.

More than 40 papers are down for presentation at the meeting, the 28th of the Society's existence. Classification of the subject mater of these contributions reveals that equipments for studio and theatre are discussed in 13 papers; 5 are concerned with laboratory technique; 4 deal with theatre procedure; 4 on studio work; with several papers on color and a discussion of television helping to round out the list. In addition, several open forums are scheduled in which pertinent topics will be discussed.

## Interest in Wide Film

Overshadowing all other topics is the question of wide film standardization. Just what will happen at the meeting to help clarify the present badly muddled wide film situation is a topic of much pre-convention speculation. Published reports during the past few months have persisted in defining the Society's position on wide film standards as one of passivity, this despite the statement of President J. I. Crabtree to the effect that the organization would continue to manifest a lively interest in the subject and that no attempt would be made to limit discussion of the topic at the forthcoming meeting. There are many who profess to believe that the Society, having once expressed its position on the matter through the medium of a report by one of its committees, would do nothing further along this line pending receipt of definite word from the producers concerning their attitude on standards.

That discussion of wide film standards can be definitely restricted to merely a reading of a committee report is seriously doubted by those who are in a position best to know. Tremendous interest in the subject is apparent in all branches of the industry, and extended discussion of the matter appears inevitable.

The papers to be presented on sound recording and reproduction will reflect



Nat Golden, member of L. U. 160 and P. A. C. award winner, who is a committee head for the S. M. P. E. meeting

no revolutionary development in this field but rather will stress the refinements which are constantly being made. One possible exception to this statement may be the paper to be presented by H. von Madaler, who will describe his process of "sound grooves" on film, in which a reproducer unit "tracks" in the groove on the film in a fashion similar to a needle tracking in a disc. This proc-

## Wide Film Standards

Regarding the attitude of the S. M. P. E. on wide film standardization, it is understood that a Society committee after much consideration has submitted to the motion picture producers its suggestions and recommendations with respect to the various processes. While the high rating of the Society within the industry lends much authority to its findings in this respect, nothing further can be done until and unless the producers get together and decide whether there will be a cooperative effort at wide film standardization.

Conflicting reports as to the present attitude of the Society on wide film continue to find their way into the trade press, but a recent statement by President Crabtree to MOTION PICTURE PROJECTIONIST indicated that there will be no attempt to limit discussion of wide film on the floor of the meetings. President Crabtree stated that wide film will receive its "due share of attention at the Fall Meeting."

ess was commented upon in a recent issue of MOTION PICTURE PROJECTIONIST.<sup>1</sup>

That existing methods of color photography are inadequate for the industry's exhibition requirements is gathered from the fact that several papers on improved color cinematography processes are listed for presentation. During the past year, and particularly within the past few months, there has been much severe criticism of existing color processes. Some difficulty has been experienced in the production procedure, and the finished product as shown in theatres has not been up to the general exhibition standard set by black and white subjects. A sharp improvement in color photography technique is very much desired by leaders in the production and exhibition branches.

## Non-Theatrical Activity

Marked activity in the non-theatrical field has been noted in the past twelve months, and many important papers on this phase of the business will be presented at the meeting. No suitable method of recording sound on 16 mm. film has yet been achieved, despite the concerted efforts of ranking technical staffs throughout the country. Grain in film and linear speed relationship are thus far the unsurmountable problems of 16 mm. film recording. Several very interesting processes which involve the use of a 16 mm. picture in conjunction with a 35 mm. sound track have been announced, but there is a lack of pertinent data available on these systems.

There is a dearth of activity in the three-dimensional motion picture field, with not a single substantial contribution having been made to the art within the past several years. "Suggestions of depth" and "illusions of depth" mark the borderline of present commercial stereoscopic ventures.

It is understood that a latest type model Grandeur projector unit will be set up at convention headquarters and that a complete film program will be shown by it. The new Grandeur mechanism is adaptable for both 35 mm. and 70 mm. film, the switch from one to another size requiring but a minute. It is not known definitely if this new Grandeur mechanism will be able to accommodate wide film sizes other than 70 mm. with similar little change.

The business meetings of the Society will be concerned with a sessions of the Board of Governors, election of officers for the coming year, and the laying of plans for a permanent headquarters in New York City which will be in charge of the new general manager of the Society who is to be named



at this meeting. This headquarters manager will also act as the editor of the S. M. P. E. monthly Journal.

Appended hereto are advance abstracts on some of the papers which will be presented at the Fall Meeting:

#### SOME CAUSES FOR VARIATIONS IN THE LIGHT AND STEADINESS OF HIGH INTENSITY CARBONS

D. B. Joy and A. C. Downes

*Research Laboratories, National Carbon Co.*

The effect of the variation in the relative positions of the positive and negative carbons in a commercial high intensity lamp burning 13.6 millimeter carbons is investigated. The futility of specifying an arc voltage without fixing the position of the positive carbon with respect to the negative carbon is illustrated. It is also demonstrated that a relatively small movement in the position of the positive

carbon crater along its axis has a greater effect on the steadiness and quantity of useful light from the high intensity arc than is ordinarily supposed. The positions of the carbons at which maximum light and the maximum steadiness of light are obtained are defined, and it is shown that for the same current the position of maximum light is not necessarily the position of maximum steadiness.

#### PRINCIPLES AND PROCESSES OF PHOTOGRAPHY IN NATURAL COLORS

Glenn E. Matthews

*Eastman Kodak Research Laboratories*

Almost from the first years in which motion pictures were used commercially, about 1895 to 1900, experimenters have been working on methods of producing them in natural colors. The only practical processes

enjoying any extensive commercial use in the theatres, however, are subtractive processes in which the color is incorporated in the film. One additive process has had extensive application for amateur motion pictures for over two years. Within the past year a large number of color motion pictures have been released with sound accompaniment so that the ultimate is being approached in motion picture photography, namely pictures in color and sound. No practical methods of obtaining stereoscopy or relief have as yet been found. The subtractive processes which have been used, however, are only two-color methods and therefore a true spectral record is not realized.

Although a simple process of color photography yielding a print which faithfully reproduces the colors of nature is greatly needed, most of the research at the present time is being directed to the perfection of color motion pictures. Another equally im-

## Program for S. M. P. E. Fall Meeting

### Monday, Oct. 20th

8:30 to 10 A.M.—Convention Registration.  
10:00 A.M.—Convention Called to Order (Roof Garden, Pennsylvania Hotel).  
Address of Welcome by Major Edward J. Bowes, Capitol Theatre, New York.  
Response by the President.  
Report of the Convention Committee.  
Reports of the Secretary and Treasurer.  
Election of Officers.  
Report of Progress Committee—G. E. Matthews, Chairman.  
“Meeting Sound Film Competition Abroad” by C. J. North and N. D. Golden, M. P. Division, Bureau of Foreign and Domestic Commerce, Washington.  
“International Relations in the Sound Picture Field” by F. S. Irby, Associate Editor, Electronics, New York.  
“Some Observations of the M. P. Industry in Russia” by J. W. Coffman, President, Audio-Cinema, New York.  
1:00 to 2:00 P.M.—Luncheon.  
2:00 P.M.—Papers:  
“The Progress of Sound Motion Picture Presentation” by Harold B. Franklin, Los Angeles.  
Report of Standards and Nomenclature Committee—A. C. Hardy, Chairman.  
Open discussion—“Methods of Securing a Large Screen Picture.”  
Report of Journal Committee—L. A. Jones, Chairman.  
Report of Projection Committee—L. M. Townsend, Chairman.  
“Principles and Processes of Photography in Natural Colors,” by G. E. Matthews, Research Laboratory, Eastman Kodak, Rochester.  
“Three Color Subtractive Cinematography,” by Palmer Miller, Brewster Color Film, Newark.  
Demonstration Film of a Three Color Lenticular Screen Process, by L. M. La Porte, Paramount Publick, New York.  
Committee Reports:  
Color Committee—W. V. D. Kelley, Chairman.  
Historical Committee—C. L. Gregory, Chairman.  
Studio Lighting Committee—A. C. Downes, Chairman.  
Theatre Lighting Committee—C. E. Ege-ler, Chairman.  
Membership Papers, and Publicity Committees—H. T. Cowing, J. W. Coffman, W. Whitmore, Chairmen.  
8:00 P.M.—Exhibition of recent films of interest in the Roof Garden, Pennsylvania Hotel.

### Tuesday, Oct. 21st

8:30 to 9:30 A.M.—  
9:30 A.M.—(Roof Garden, Pennsylvania Hotel.)  
“An Entertainment City,” by R. N. Goldsmith, Vice-President, Radio Corp., New York.

“Recent Developments in Newsreel Sound Recording Equipment,” by P. M. Robillard and E. F. Lyford, RCA Photophone, New York.  
“Some New Studio Recording Equipment,” by W. P. Dutton and S. Read, RCA Victor Co., Camden.  
“Improvements in Dynamic Speakers,” by I. Bobrovsky Serge, Consulting Engineer, Rochester.  
“Carbon and Condenser Microphones—Their Characteristics in Construction and Use,” by W. C. Jones, Bell Telephone Labs., New York.  
Open discussion: “Advantage and Disadvantages of Placing Sound and Picture on Separate Films.”  
12:30 to 1:30 P.M.—Luncheon.  
1:30 P.M.—Papers (Roof Garden, Pennsylvania Hotel):  
“Motion Study with the Motion Picture Camera,” by Alan Mogenson, Associate Editor, McGraw Hill Publishing Co., New York.  
“A New Sound Picture Theatre Reproducing System,” by G. Fuller, Bell Telephone Labs., New York.  
“A New Type Glow Lamp for Recording Sound on Films,” by Joseph B. Zetka, New York.  
“The Madalar Process of Sound Recording and Reproducing,” by H. Von Madalar, Hampton Bays, L. I.  
Demonstration Film Recorded by the Use of a Reflector in Combination with a Microphone—H. W. Dreyer and M. C. Batsel, RCA Photophone, Inc., New York.  
“Film Noise of Non-Electric Origin,” by John O. Frayne, Electrical Research Products, Hollywood.  
“Some Experiences in Adapting Theatres for Sound,” by L. M. Townsend, Paramount Publick, New York.  
“A 16 mm. Portable Sound on Film Projection Equipment,” by C. R. Hanna, P. L. Irwin and E. W. Reynolds, Westinghouse, East Pittsburgh.  
6:30 to 7:30 P.M.—Dinner.  
Entire evening set aside for visiting Broadway theatres.

### Wednesday, Oct. 22nd

9:30 A.M.—Papers (Roof Garden, Pennsylvania Hotel):  
“Cinematographic Analysis of Mechanical Energy Expenditure in the Sprinter,” by C. A. Morrison, Eastman Teaching Films, Rochester, and W. O. Fenn, University of Rochester, School of Medicine and Dentistry, Rochester.  
“Additional Characteristics of High Intensity Arcs,” by D. B. Joy and A. C. Downes, Research Laboratories, National Carbon, Cleveland.  
“Double Topping of Motion Picture Film,” by L. I. Crabtree and W. Marsh, Research Laboratory, Eastman Kodak, Rochester.

“Some Observations on Stereoscopic Projection,” by J. B. Taylor, Research Laboratory, General Electric, Schenectady.  
“Removing the Fire Hazard from the Handling and Storage of Film in Laboratories,” by R. C. Hubbard, Consolidated Film Industries, New York.  
“Some Applications of the Comparison Microscope in the Film Industry,” by O. E. Conklin, Redpath Laboratory, DuPont Pathe Film, Parlin, N. J.  
“The Rocono Treatment for Film Rejuvenation,” by A. P. Rittenbein, New York.  
“Reducing Solutions for Motion Picture Film,” by J. I. Crabtree and L. E. Muehler, Research Laboratory, Eastman Kodak, Rochester.  
1:00 to 2:00 P.M.—Luncheon.  
2:30 P.M.—Boat Trip Around Manhattan Island. Boat leaves Battery Pier at 2:30 P.M.  
7:30 P.M.—Semi-Annual Banquet in the Grill Room of the Pennsylvania Hotel. Dancing afterward.

### Thursday, Oct. 23rd

9:30 A.M.—Papers (Bell Telephone Laboratories):  
“A Modern Laboratory for the Study of Sound Picture Problems,” by E. E. Shea, Bell Telephone Labs., New York.  
“Peculiar Engineering Problems in the 16 mm. Field,” by E. C. Fritts, Eastman Kodak, Rochester.  
Two-Way Television Demonstration by H. E. Ives, Bell Telephone Labs., New York.  
“A Damped Diaphragm Sound Reproducer,” by Rudolph Miehl, Universal Sound System, Philadelphia.  
“The World’s Most Powerful Microscope,” by F. F. Lucas, Bell Telephone Labs., New York.  
1:30 to 2:30 P.M.—Luncheon (courtesy of Bell Telephone Labs., Inc.).  
2:30 P.M.—Trip through Bell Telephone Laboratories, including Sound Film Laboratory.  
7:30 P.M.—Papers (Roof Garden, Pennsylvania Hotel):  
“Two-Solution Development of Motion Picture Film,” by J. I. Crabtree, H. Parker and H. R. Russell, Research Laboratory, Eastman Kodak, Rochester.  
“Aiding the Theatre Patron Who is Hard of Hearing,” by F. H. Graham, Electrical Research, New York.  
“The Photoflash Lamp,” by Ralph E. Farnham, General Electric, Cleveland.  
“Higher Illumination for Non-Professional Projector Equipments with Low Voltage Tungsten Filament Lamps,” by V. J. Roper, General Electric, Cleveland.  
“Electrical Instruments for Test Purposes,” by A. H. Wolferz, Weston Electrical Instrument Corp., Newark.  
“A New and Simplified 16 mm. Projector and Camera,” by C. E. Phillimore, Peko, Inc., Chicago.



portant field is the use of color photography in photomechanical printing processes as colored illustrations have come into very extensive use during the past fifteen years. The work of different investigators may naturally be divided into (1) still photography including color photographs to be viewed by transmitted light and by reflected light, and (2) motion picture color photography.

(The discussion of the different processes as given in the lecture is prefaced by a description of the principles involved in the photographic reproduction of color.)

#### ELECTRICAL INSTRUMENTS FOR TEST PURPOSES

A. H. Wolferz

*Weston Electrical Instrument Corp.*

This paper contains the outline of a proposed electrical test set for servicing sound projection equipment and other similar apparatus. The proposed set is portable and will be useful in carrying out the following tests:

Testing of the amplifier tubes.

Measurements of filament or heater voltages or currents, plate voltage and current, grid voltage, cathode voltage at the tube socket while the amplifier is in operation.

Measurements of rectifier tube plate currents and transformer secondary voltages.

Resistance measurements and continuity of circuit tests.

Capacitance of condensers.

Input and output voltages of amplifiers.

#### THE MADALER PROCESS OF SOUND RECORDING AND REPRODUCING

H. von Madaler

After 10 years of experimenting the writer has succeeded in producing an entirely new talking film of a quality equal to the systems now in use, and also having several advantages over these systems.

First, the recording can be immediately reproduced as soon as it is recorded and can be played over 250 times without losing any of its quality; second, it is not necessary to reduce the size of the picture frame as is the case of the present sound photo-film systems; third, any colored film can be recorded successfully and oil, dirt and scratches on the film do not affect sound reproduction.

The record groove on this new talking film is exactly like the Victor record. The depth and width is about two thousandths of an inch and this record is impressed with a diamond point which is half round on the point. The film is also reproduced with a similar point.

Recording has been successfully achieved on a standard film 35 mm. with a speed of 90 feet per minute and

#### S.M.P.E. Membership Gain

The total membership of the S. M. P. E. now approximates 750, according to a recent report of the Membership Committee. Interest in the Society has grown enormously within the past several years with practically every branch of the industry now having many representatives on the Society roster. The formation of local Society sections is believed to have given impetus to an aroused interest in the Society, the various local memberships having established regular meeting dates for sessions at which inter-convention happenings are discussed.

Society officials are looking forward to a membership of 1,000 or more by the time of the Spring Meeting in 1931.

also on a 16 mm. film at a speed of 24 pictures per second or 36 feet per minute. A thorough test in recording was made in the experimental laboratories of the Eastman Kodak Company at Rochester and it was found, with the help of an oscillator, that there was no difficulty in recording frequencies from 50 to 5,000 cycles on a 16 mm. film which has a two and a half times slower speed than the standard 35 mm. film. This film has now sufficient quality to be put on the market.

For recording the sound waves there has been constructed a very simple machine which consists of a sprocket of about 1 3/4 inch diameter which is mounted on a shaft on one end and a suitable flywheel on the other end. This flywheel is driven from a synchronized motor in the usual way. For reproducing a similar device is used and an electrical pickup is employed for reproducing the sound.

There has been constructed a specially made electrical recording unit which is more powerful than any other recording unit as much more power is needed to engrave in a celluloid film than in a wax record. The film is recorded in its ordinary cold state and no preparation is necessary for recording on the film. For recording on the standard film a 4 stage double push-pull 250 tube amplifier is used and for reproducing this same amplifier can be used also.

For reproducing and recording a 16 mm. film a 4 stage 245 push-pull amplifier is used with very good results.

It is hoped that this new system will be used universally in all theatres and homes on account of its simplicity, manufacture and operation; and also because the cost to produce this film will be much less than that of the present systems now in use.

#### A DAMPED DIAPHRAGM RE- PRODUCER

Rudolph Miehl

*Universal Sound Systems*

This paper deals with a new type of speaker recently perfected which differs from both exponential and cone type horns and yet retains the best features of both. It is termed the Damped Diaphragm Reproducer because of the peculiar construction of this portion of the instrument. It employs a large, metallic diaphragm rigidly attached to a heavy iron ring. The dynamic driving system is attached to the center of the diaphragm and serves to actuate the diaphragm. The diaphragm, which is made of duralumin, .002 of an inch thick, is not stretched on the ring so its natural period of vibration will be above audibility. The tension on the diaphragm is such as to place its resonance point within the audible range.

To prevent resonance at this particular frequency the diaphragm is damped by attaching strips of balsa wood so placed that its response is constant throughout the audible range. By the proper arrangement of damping strips, adjustment of air gap and diaphragm tension, it is possible to tune the speaker so that it will have a rising characteristic as the frequency increases or a falling characteristic as may be most desirable under the conditions met with in its use.

Its wide range of frequency response and its characteristics over that range enables this speaker to meet easily all demands of the sound projection field. Its high efficiency and permissible power input as well as its wide distribution characteristic make it desirable from the standpoint of economy, both in lowered amplifier output and reduced number of units necessary for given sound level. To these must be added the factor of naturalness or fidelity of output. This can only be determined by hearing tests but when a speaker produces sound that is easy to listen to and unobtrusive, these requirements have also been met. On all points then, the damped diaphragm reproducer promises better sound at less cost.

#### CINEMATOGRAPHY WITH THE LARYNGOSCOPE

C. A. Morrison

*Eastman Teaching Films*

A new technique for making motion pictures of the vocal cords has been developed by the use of a quartz rod as the means of projecting a high intensity illumination within the larynx. The source of light consists of the two filaments of an over-volted automobile bulb. A laryngoscope, illuminating system and viewing finder are attached to a 16 mm. motion picture camera. This combination forms a self-contained, one-man-controlled diagnostic unit, which permits motion



pictures of the cords to be made at the standard rate of 16 frames per second. The field photographed is viewed constantly through the finder by the operator, who controls the spring motor of the camera by the usual release button. The pictures are projected fill the entire screen area. This is a magnification previously unattained under these conditions.

## IMPROVEMENTS IN DYNAMIC SPEAKERS

I. Bobrovsky Serge

*Utah Radio Products Corp.*

Acoustical problems are considered on the basis of a point source of sound. The number of sound sources leads to a number of technical problems. One unit is ultimate solution, not yet reached. But necessity of fewer units is imperative.

Problem was to develop a cone type dynamic speaker which will have large power of ratio, so that the ideal conditions may be approached. Problems of developing cone dynamic speaker for auditorium use are numerous and I bring a most important one.

1. Increase of output results in increased size of voice coil.

2. Maintaining as high flux density in the air gap to obtain highest ratio between mechanical watts radiated to electrical watts input. This accomplished by developing an alloy with highest possible saturation point than material used at present time commercially.

### Reduction of Leakage

3. Proper design of magnetic circuit which will develop maximum flux in the air gap for the total given flux. That results in selection of a set of dimensions to obtain minimum leakage flux. Substantial reductions of leakage are secured in design of new super dynamic speaker.

4. Increase of pole face to give a large and uniform density in the air gap. That will result in maintaining voice coil in uniform flux densities at all amplitudes to prevent subsequent variations in impedance that are detrimental to conversion efficiencies.

5. Use of proper number of turns and resistance for the field winding of the speaker unit. Inasmuch as fewer units are to be used, with the super type of dynamic speaker, higher field watts input are permissible.

6. Cone of dynamic speaker and its suspensions is a very important factor. Continuous experiments with cone and its suspensions produced a cone which is able to withstand high ratio of transfer of electrical energy to mechanical energy.

### Proper Coupling

7. Proper coupling of sound producing unit with an auditorium is very important problem and use of baffle horn seems to be superior to the other type of coupling.

However, each auditorium presents

special problem as far as size and dimensions of coupling medium are concerned. Necessity of a super dynamic speaker which will reduce numerous technical problems is evident.

## REQUIREMENTS FOR A PRACTICAL SYSTEM OF THREE COLOR SUBSTRACTIVE CINEMATOGRAPHY

Palmer Miller and P. D. Brewster  
*Brewster Color Film Co.*

Our paper first considers the necessary requirements in the camera—the comparison of advantages of using a single negative to record the three color separations and the use of three separate negatives—followed by a study of the advantages of using separate films sensitized for different colors, to aid in obtaining sharp separations in comparison to the use of panchromatic film and filters.

### The Camera Lens

The question of the speed and the range of focal lengths of the lenses required in the cameras for practical use in the studios are considered.

Different possibilities for the production of the positive prints are then considered with special attention to dye mordanting processes. Requirements as to definition of the image, range of color and clarity of color are discussed.

Paper concludes with a number of slides, showing curves of filters, curves of desired color separations and transmissions of H & D strips. The effect of superposing different color strips is demonstrated.

## DUBBING AND ITS RELATION TO SOUND PICTURE PRODUCTION

George Lewin

*Paramount-Publix Corp.*

### I Meaning of Dubbing

- (a) Originally applied to straight re-recording.
- (b) Now usually applied also to synchronizing and scoring in which sound tracks are used.
- (c) Also used to describe faking of dialogue for foreign versions of domestic pictures.

### II Reasons for Dubbing

- (a) To transfer from film to disc or vice versa for release purposes.
- (b) To re-record for purpose of equalizing level variations, or changes in quality.
- (c) To add sound effects which can best be recorded artificially.
- (d) To add sound effects or music which would hamper the original recording or stage action, if made while original recording was taking place, or which would be spoiled when film is edited.

- (e) For scoring and synchronizing, using sound tracks instead of direct pick-up on music, to avoid use of an expensive orchestra for a long period.
- (f) For adding sound effects from sound tracks, where it would be difficult or impossible to use direct pick-up of the sounds—such as real street noises, train noises, applause, etc.

### III Kinds of Dubbing

- (a) Straight dubbing
  1. Film to disc
  2. Disc to film
  3. Film to film
  4. Disc to disc
- (b) Combined dubbing and synchronizing.
  1. From film, non-synch. outfits and direct pick-up to film or disc.

### IV Technical Problems in Dubbing

- (a) Reproduction of sound for dubbing must be better than for reproduction in theatres.
  1. Defects of ordinary projectors.
  2. The problem of "green" film.
- (b) Special machines for high quality reproduction.
  1. Modified film recorder for reproduction.
- (c) Frequency characteristics of recording and reproducing apparatus.
- (d) Dubbing equalizers.

### V Other Forms of Indirect Recording

- (a) Subsequent photography.
- (b) Dialogue faking in extreme long shots, or where speakers are not visible.
- (c) Trick effects.

## A 16 MM. PORTABLE SOUND ON FILM PROJECTION EQUIPMENT

C. R. Hanna, P. L. Irwin and E. W. Reynolds

*Westinghouse Elec. & Mfg. Co.*

A portable sound on film projection equipment using 16 mm. film is described. The film is standard with the exception that one row of sprocket holes is omitted to provide space for the sound track.

The projector is only slightly larger than the average silent picture projector. Detailed description of its mechanical, electrical, and optical features is given.

### Complete in 3 Cases

The complete equipment is mounted in three carrying cases, one for the projector, one for the amplifier, and one for the loud speaker and screen. The projector case serves also as a soundproof housing when the equipment is in operation. The rewind, splicer, cables, spare tubes and lamps, and the films are located in the case for the loud speaker and screen. Each of the carrying cases weighs approximately 40 pounds, making the total weight of the equipment 120 pounds.



# A Standard Release Print

**A** FORM of standard release print which is expected to clarify for all time the problem of uniform projection with respect to standardized changeovers and thereby save the industry at least a million dollars yearly in replacement print costs has been promulgated by the Academy of Motion Picture Arts and Sciences, of Hollywood, in collaboration with every technical branch of the motion picture industry. The standard becomes effective November 1.

The standard was worked out by a sub-committee of experts under supervision of The Academy Producers-Technicians' Committee, of which Irving G. Thalberg is chairman, and involved survey, analysis, and correlation of practices and opinion of technicians in the studios, laboratories and theatres throughout the country, production of test reels, and experimentation with various methods.

The committee of experts which worked out specifications for the standard consists of Sidney Burton, representing the projectionists; N. H. Brower, representing the exchanges; A. J. Guerin, laboratory representative; I. James Wilkinson, film editor; and Gerald F. Rackett, former manager of the Technical Bureau. Sidney J. Twining, another representative of the laboratories, served as chairman.

## Salient Features of Plan

Salient features of the new standard are as follows:

1. Standard nomenclature for different types of prints as well as for the units comprising each reel.
2. Standard inscription for identification.
3. Standard synchronizing marks.
4. Standard method for change-over from reel to reel.

During the next three weeks an advance educational program will be conducted to pave the way for the standard. It is hoped to reach every theatre, exchange, and studio in the country acquainting theatre and exchange managers, projectionists, film editors and laboratory executives with the features of the new standard.

In bringing about a uniform method of change-over, one of the most irksome problems in projection should be solved. At the present time the individual projectionist puts on his own change-over marks. These accumulate and give rise to a constant demand for replacement by exchanges.

The new change-over signals consist of circular opaque marks with transparent outline printed from the negative. Each signal is four frames in length and is placed in the upper right hand corner of the frame. At the first signal, known as the motor

cue, the projectionist starts the motor of the incoming machine; at the second signal, known as the change-over cue, the change-over is accomplished.

## 12-Foot Pick-Up

The time between the two signals is eight seconds or twelve feet of film. This allows the incoming machine to pick up to normal speed and reach the continuation of the picture in time to accomplish the change-over smoothly.

After the projectionist has determined the time of pick-up of his machine he will know how many feet of film his incoming machine requires while the final twelve feet is being run out on the outgoing machine. He

identifies this footage with a number on the synchronizing leader and threads up accordingly.

In addition to the change-over system, the standard specifications cover the leaders both at the beginning and end of the picture. At the beginning the leader consists of three parts: protective leader (4 to 6 feet), identification leader (4 feet), containing the part number and picture title.

This is followed by a synchronizing leader (14 feet in length) the first section of which (2 feet) is opaque followed by a frame in which the word "start" is printed in black letters on a white background. Footage indicator numbers on the syn-

---

## To the Projectionist:

**P**RESENTATION in these columns of data on the new standard release print would be incomplete without some supplementary statement such as this. Certain facts are self-evident from merely a casual reading of the specifications of this new standard; but there is another phase of the situation which should be clarified—and that the position of the projectionist with respect to the introduction of the standard.

Someone has said that any standard represents merely a difference of opinion, and this certainly is true of the release print standard. The latter is not an arbitrary code drawn up to the liking of any special group within the industry but is the result of months of painstaking work on the part of all motion picture technical branches. There is nothing compulsory about this standard—it represents a cooperative movement on the part of producers, studio workers, exchanges, and projectionists, and simply because it is a cooperative effort the responsibility of each and every branch of the industry to put the idea over is increased tremendously.

The standard is flexible in that if practice proves it inadequate in any respect it can and will be changed to meet conditions. The standard represents the consensus of opinion at the moment—all are agreed that a change will be made if necessary. There may be some—or many—projectionists who disapprove of the standard. The writer through long experience has been made aware of many "ideal" plans for the perfect changeover, but he has never come across one that could be seriously considered as a standard. Criticism of the new standard is expected—is, in fact, welcome. After November 1, when the new standard goes into effect, we hope to find our mail bag crammed with comment on the plan. Favorable, lukewarm, unfavorable—whatever the temper of your reaction may be, send it in. We would like to get the reaction of every projectionist in the country to this plan. Don't hesitate; send in your thoughts on the matter and they will receive full consideration. Without this help the work expended on the standard will go for naught.

Without the cooperation of the projectionist this standard release print plan is not worth the paper on which it is written. Some projectionists will say, "I don't like the plan"; but he will not be fair to himself and to his brother craftsmen if he doesn't take the trouble to tell us WHY he doesn't like it. As a matter of fact, every projectionist in the country had a hand in the drafting of the plan, just as surely as though he had sat in on conferences on the matter. Your representatives—men who rank highest in your craft—have given their time and a lot of hard work to secure consideration for your ideas. They have spoken for you—thus far. The rest is up to you.

Plans are now in the making to place a copy of these release print specifications in the hands of every projectionist in the country. The full resources of the Academy of Motion Picture Arts and Sciences, American Projection Society, and Projection Advisory Council are behind this standard and nothing will be left undone to put it across. As we said before, the degree of success attained in this movement is up to each individual projectionist. The battle will be fought in the projection room and not with type, ink and paper.

It's up to you now, and you will be judged solely on the basis of performance.

JAMES J. FINN.

---



chronizing begin three feet from the first frame of the picture and are numbered three to eleven.

The ending of the reel will consist of 6 feet of opaque runout trailer, 4 feet of identification trailer, and 4 to 6 feet of protective leader.

#### Projection Leaders Aid

Leaders among the projectionists who have been active in the progress of the standard are George Edwards, International President, American Projection Society; Thad Barrows, President, Projection Advisory Council; Harry Rubin, Supervisor of Projection, Publix Theatres; Jess Hopkins, Publix Theatres; R. H. McCullough, Supervisor of Projection and Electrical Equipment, Fox West Coast Theatres; Lester Isaac, Supervisor of Projection, Loew Theatres; Le Roy Cox, Supervisor of Projection, R-K-O Theatres; Charles Eichhorn, Vice-President of Local Union 306, New York City; P. A. McGuire, Executive Vice-President, Projection Advisory Council; and James J. Finn, Editor, MOTION PICTURE PROJECTIONIST.

Sidney Burton, First Vice-President of the Council and President of Chapter 7, A. P. S., was, of course, a member of the committee which drafted the standard.

Efforts to improve the make-up of release prints and change-over cues were begun in Hollywood more than a year ago. The confusion and complete lack of uniformity among studios was one of the by-products of the abrupt introduction of sound. Until the more urgent production problems could be taken care of many important factors contributing to the presentation of the picture had to wait.

In September of last year the need for correlating practice in the make-up and handling of release prints was

recognized and a committee was formed by joint action of the Technicians Branch of the Academy of Motion Picture Arts and Sciences, the local chapters of the American Projection Society, the American Society of Cinematographers and the Society of Motion Picture Engineers. This committee included: Sidney J. Twinning, chairman, manager of sound track laboratory, Paramount-Publix West Coast Studios; N. H. Brower, then president of the Los Angeles Film Board of Trade; A. J. Guerin, manager of Plant No. 7, Consolidated Film Industries, Inc.; Sidney Burton, president of the California Chapter, American Projection Society; Gerald F. Rackett, then manager of the Technical Bureau; I. James Wilkinson, chief film editor of Paramount-Publix West Coast Studios; and

Donald Gledhill of the Academy Technical Bureau, secretary.

The committee attacked the problem and set about drawing up tentative specifications for release print practice which could be made uniform. The cooperation of the Academy and of the Association of Motion Picture Producers was extended to the project. The original group was constituted a sub-committee of the Producers-Technicians Committee of the Academy and representatives of the seventeen major studios were appointed to collaborate with them.

During the subsequent months, various aspects of the problem were carefully studied by the committee, test reels were made, and a series of meetings with the studio, theatre and exchange representatives and conferences with smaller groups were held

## Specifications of Standard Print

### Part I

#### PROTECTIVE LEADER

Either transparent or raw stock.

When the protective leader has been reduced to a length of four feet it is to be restored to a length of six feet.

4 Ft.  
to  
6 Ft.

#### IDENTIFICATION LEADER (Part Title)

Shall contain not less than 32 frames in each of which is plainly printed in black letters on white background, type of print (See Nomenclature), part number (Arabic numeral not less than  $\frac{1}{2}$  of frame height), and picture title.

4 Ft.

#### SYNCHRONIZING LEADER

First section shall be opaque.

Start mark shall be one frame in which is printed START (inverted) in black letters on white background  $\frac{1}{2}$  of frame height.

A white line  $\frac{1}{32}$  inch wide upon which is superimposed a diamond  $\frac{1}{8}$  inch high by  $\frac{3}{8}$  inch wide shall be printed across the picture and sound track area at a point exactly 20 frames ahead of the center of the start frame.

Beginning 3 ft. from the first frame of picture, each foot is to be plainly marked by a transparent frame containing an inverted black numeral at least  $\frac{1}{2}$  frame height. Footage indicator numerals shall run consecutively from 3 to 11, inclusive.

This section shall be opaque and contain frame lines thruout entire length which do not cross sound track area.

At a point exactly 20 frames ahead of the center of each footage numeral frame there shall be a diamond (white on black background)  $\frac{1}{8}$  inch high by  $\frac{3}{8}$  inch wide.

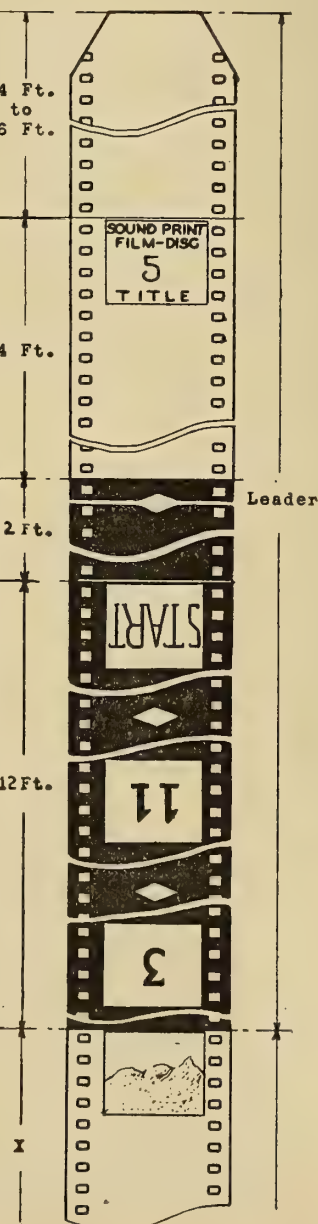
2 Ft.

12 Ft.

Leader

#### PICTURE

It is recommended that picture action start and finish on fades wherever possible, otherwise significant sound should be kept at least five feet from the start and finish of the picture.



### Print Nomenclature

Four types of film are defined in the standard nomenclature pertaining to the new release prints, as follows:

**Sound Print-Film**—A print with a photographic sound record integral with the print.

**Sound Print-Disc**—A print with a disc sound record.

**Sound Print-Film and Disc**—A print with a photographic sound record integral with the print and a corresponding disc sound record, either of which may be used.

**Silent Print**—A print without a sound record.

**Leader**—That part of the print from the beginning to the first frame of picture.

**Picture**—That part of the print between the leader and the runout.

**Runout**—That part of the print from the last frame of the picture to the end.



to insure that the specifications represent an efficient and practical solution.

#### Subject to Revision

Of interest is the following joint statement issued by S. J. Twining, chairman of the Sub-Committee on Correlation of Release Print Makeup Practice, and Lester Cowan, Manager of the Academy Technical Bureau:

"These specifications have been worked out during the past eight months by a sub-committee of the Academy of Motion Picture Arts and Sciences in advisement with technicians appointed by the seventeen major Hollywood studios and theatre and exchange representatives. The standard release print applies to sound prints on film, on disc and combina-

tion prints. It is designed for adaptability to studio production and dubbing requirements, to laboratory practice, to efficient handling in exchanges and to better enable projectionists to make change-overs without rehearsal or marking and mutilating prints.

"The following pages are a preliminary outline of practice in relation to the makeup, maintenance and theatre handling of prints.

"Revision of the specifications will be made periodically as necessary to further the general purpose of contributing to the highest quality of sound picture presentation."

The standard release print was designed to make threading up, synchronizing, change-over and handling

of prints easier for the projectionist. Take advantage of the new system as you would an improvement on your machine.

Spend a half hour in rehearsing change-over on the first standard print that comes in to your theatre in order to determine the pickup of your machines. As the leaders and cues on all standard prints will be just the same from then on, all change-overs will be just the same.

1. Every standard print you receive from the exchange will have the words printed or stamped on the reel band.

2. Do not mark or mutilate any footage of leader ahead of the action or in the runout. Remember that the reason the standard is a convenience to you is because it is measured exactly.

3. The protective leader and the protective trailer are never to be less than four feet or more than six feet in length when sent out by the exchange.

4. Any special instructions by the producer of the picture will be found in the two feet of leader immediately following the part title and the two feet immediately following the end-of-part title.

#### 5. How to Find "Actual Change-over Footage"

Fifteen or twenty minutes rehearsal per machine will be necessary when you receive your first picture made up on the standard release print. Once you know your speed you can change-over between any standard prints from then on without any additional cues or rehearsal.

The "actual change-over footage" is the length of leader which must be left to run through the incoming machine in order to make a perfect change-over. In other words, it represents the leader that will run through the incoming machine in eight seconds. (Eight seconds is required to complete the change-over as the start motor cue is twelve feet from the end of the outgoing reel).

The easiest way to determine your "actual change-over footage" is to rehearse by placing the footage frame numbered 11 in the aperture of the incoming machine. Then change-over according to the cues, starting the motor of your incoming machine the instant you first see the start motor cue and throwing the douser switch the instant you see the change-over cue. If there is a lapse between the two reels showing on the screen try it again by placing the footage frame number 10 in the aperture of the incoming machine. Continue this process with the same machine trying footage frame numbers 9, 8, 7 and so on until you have found the foot and the frame in the foot which when threaded up at the aperture will give you the exact change-over. This frame then marks your exact change-over footage for that machine. As all standard prints will be of exactly the

## Specifications of Standard Print

### Part II

#### MOTOR CUE

Shall be circular opaque marks with transparent outline printed from the negative which has had four consecutive frames punched with a serrated edge die .034 inch in diameter. The center of these holes is to be half-way between the top and second sprocket holes .281 inch from the right-hand edge of the film with heads up and emulsion toward the observer.

11 Ft.

#### CHANGE-OVER CUE

Shall be the same as Motor Cue.

1 Ft.

#### RUNOUT TRAILER

Shall be opaque.

6 Ft.

#### IDENTIFICATION TRAILER (End-of-part title)

Shall contain not less than 32 frames in each of which is plainly printed in black letters on white background: End of Part, part number (Arabic numeral not less than  $\frac{1}{2}$  of frame height), and picture title.

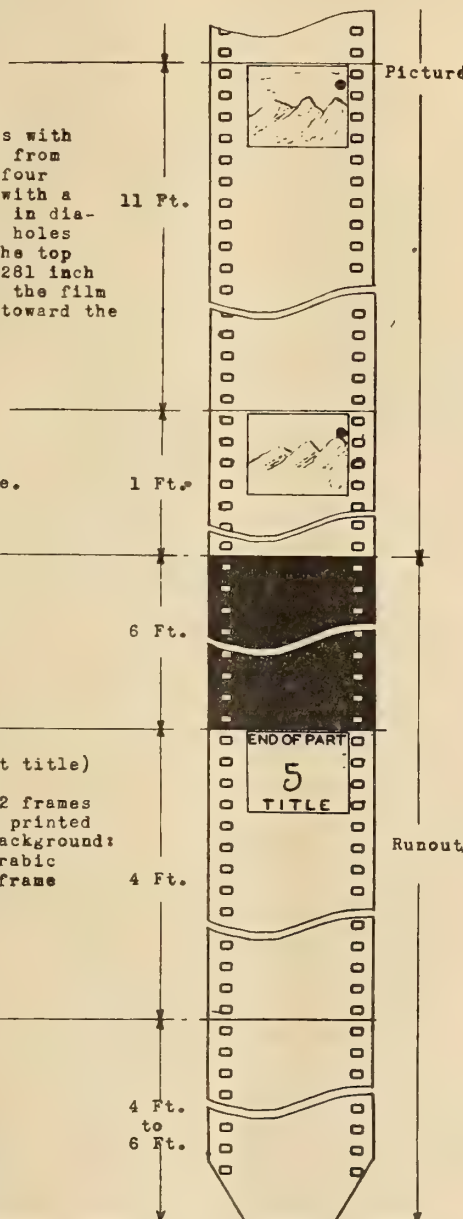
4 Ft.

#### PROTECTIVE TRAILER

Same as protective leader.

4 Ft.  
to  
6 Ft.

Running  
Direction  
↑  
Emulsion up.





same leader footage you will be able to run down to the footage frame number you have found to be necessary for a perfect change-over and this same frame number will always be in your picture aperture when starting the incoming machine. Repeat the timing process for the other machine or machines as there is often appreciable variation between the pickup speed of two machines in the same projection room.

#### 6. Threading for Disc

In threading up for disc, set the needle on the disc at the synchronizing mark and thread the start mark frame into the picture aperture of the projection machine. Then turn down the machine until the proper footage numeral appears in the picture aperture. If the turn down is not made in this manner, changing over from the signals on the outgoing reel will not be successful.

When running down the machine to the proper footage number note the revolutions of the turntable. This will simplify the process of threading.

#### 7. Threading for Movietone

Once you have determined the actual change-over footage which must be left to run through the incoming machine it is simple to thread up each standard leader so that the same footage frame number will be at the aperture ready for the start.

If you wish to test the length of your loops to insure synchronism thread up so that the start frame or any numbered footage frame is the aperture. A diamond mark will show at the sound gate as the diamonds are placed twenty frames ahead of the start frame and footage numerals. You can then turn down to have the exact frame in the aperture for the change-over footage.

#### 8. Change-over

When you see the motor cue start the incoming machine.



Harry Rubin, P. A. C. Technical Co-ordination Committee



Sidney Burton, member of Standardization Committee

When you see the change-over cue throw the douser switch.

#### 9. The Cues

The *motor cue* is a circular opaque mark with transparent outline printed in the upper right hand corner of four consecutive frames. The first of these frames is exactly twelve feet from the end of the picture. This distance, like the length of the synchronizing leader, was designed to accommodate the variety of pickup speeds among machines in use.

The *change-over cue* is a mark like the *motor-cue* on four consecutive frames, the first of which is one foot from the end of the picture. In placing the change-over cue in this position it was assumed that the average time lapse occurring when an alert operator sees the cue on the screen until he throws the douser switch is half a second. It is essential that the operator throw the switch immediately the cue flashes on the screen if the change-over is to be perfect.

#### 10. Counting Disc Revolutions

When playing discs with standard release prints many projectionists prefer to count the revolutions of the disc to reach the proper turn down for perfect change-over.

#### 11. Change-Over on RCA Machines

Because of the almost instantaneous pickup of RCA projectors, reels may be threaded up at the start frame for these machines and the standard signals at the end of the outgoing reel employed for motor start and change-over. In this case practically the same amount of footage will be run through on the incoming reel as on the outgoing reel.

#### 12. Partial Exceptions to Standard Prints

It will naturally be some time before the standard release print comes into universal use throughout the

country, as past releases will continue in circulation.

The dubbing process of some producers realizing on disc necessitates the use of more than twelve feet of leader between the start frame and the action. These prints will be standard in other respects and as the footage will be numbered at every foot up to the start frame the projectionist can readily see the length of his leader without measuring.

#### Handling Standard Prints In the Exchange

1. Exchange Film Inspectors are expected to make sure that every print inspected conforms to the measurement outlined in the Standard Specifications. Any cut outs or mutilations in either the leader or run-out will affect the change-over. It is suggested in this regard that a standard charge be made for any mutilation of leader or run-out and that any theatre returning a print with a reel damaged in this manner be charged for it, and that a complete new leader or run-out be used each time rather than making patches.

2. The protective leader and the protective trailer attached to the front and end of the leader and run-out respectively are intended to facilitate threading and protect the rest of the print. When either leader has been whipped down to four feet, the length should be restored to six feet by the exchange inspector before sending that reel out again.

3. It is suggested that the nomenclature of the parts of a print be thoroughly understood and used by all exchange employees handling prints.

4. It is important that the exchange stamp or print the words **STANDARD PRINT MAKEUP** on the band of every reel which fulfills the standard specifications.

#### Makeup of Reels In the Studio

The standard print will be a distinct convenience to the studio cutter and in the handling of negatives through the dubbing processes.

1. While each reel division involves



Herbert Griffin, P. A. C. Technical Co-ordination Committee



an individual problem in cutting it is recommended that picture action start and finish on fades wherever possible. Otherwise significant sound should be kept at least five feet from the start and finish of the picture. This extra footage insures steadying down of the projector carrying the incoming reel before significant sound is reproduced and also allows a margin of safety on the change-over.

2. In the case of change-over on a fade, the fade itself is considered as "picture" in the terms of the specifications. The change-over cue will be put 12 feet and the motor cue one foot from the end of the fade. The six feet of opaque run-out trailer is in addition to the fade.

3. The line across both picture area and sound track twenty frames ahead of the start mark frame will serve as the base for all matching of sound track and picture in making up the original negative.

4. The protective leader and the protective trailer of course apply

specifically to the release print. However, these lengths of either transparent or raw stock can with advantage be carried through most of the studio operations.

5. The form of the part title is definitely specified. The part title is to occupy at least the first 32 frames of the Identification Leader. It may be extended to the entire four feet if desired. Otherwise the second 32 frames may be left blank or provide space for cueing or other instructions according to individual studio policy.

6. As the Synchronizing Leader is uniform for all prints it is only necessary for the cutting department to specify it to the laboratory. If these leaders are applied by the cutting department to sample prints, care should be exercised to see that the synchronizing leader has been retained in its full length.

7. The visible signal will show as a black dot against light background and as a white circle against dark background. No special cutting is necessary on account of the signal.

both from the standpoint of picture and sound. This is dependent upon the efficiency of a series of craftsmen any one of whom has the power of spoiling the final show; and the projectionist is in a position where he will show the product as given him and if this product contains mistakes and is faulty in other respects he cannot do anything but project the bad features along with the good.

"The Academy stresses that every individual craft—projectionist, sound engineer, laboratory technician, and all the others—should realize that the quality of sound pictures will not be improved if we devote ourselves to buck-passing and blaming the other fellow. Progress will come only with the realization that everyone must perform to the best of his ability his own particular part. Then, if the final result is not what had been hoped for or expected, each individual must show good sportsmanship by recognizing that he himself may have been partly to blame and that it isn't always the other fellow's fault.

#### Understanding Needed

"Now, if an attitude of tolerance and understanding among these crafts can be reached, much will have been done to eliminate this useless charge and counter-charge or buck-passing which serves only to incite further arguments.

"The idea beyond your Projection Advisory Council is an excellent one. Every craft should have an organization which stands ready to defend its reputation against unjust attack. On the other hand, I hope that the Projection Advisory Council will do just that—that they will defend the projectionist against injustice but will not go further and blame the other fellow for all bad results. I am sure that the intelligence and standing of the men who subscribe to the ideas of your Advisory Council will recognize that in this industry we must all work together to give the public better sound pictures and that if these pictures are not better all will suffer.

"So far as the Academy is concerned, we would like to impress your membership with one thought, and that is that our interest is in the artistic quality of the product as shown to the public, and the Academy aims to do everything it can to improve and better quality standards. Our task is not to represent any particular group, but the common interest of the industry as a whole. Our publications, through which information and ideas are cleared, are as open to the projectionists as a medium for dissemination of information as they are to any other craft. We stand as a neutral organization aiming to bring about better understanding and better coordination which we are sure will show itself finally in better pictures and greater prosperity for all."

LESTER COWAN.

## Asks Tolerance and Understanding

(In Answer to Sidney Burton)

IN the October issue was published a statement by Sidney Burton, Vice-President of the Projection Advisory Council and President of A. P. S. Chapter 7 which set forth in admirable style the position of the projectionist in the general scheme of things in the motion picture industry. The general tenor of Mr. Burton's remarks was that the projectionist was being unfairly treated by the industry at large in that the fine quality of work he was doing was being ignored and instead of receiving praise for good work he was too often blamed unjustly for certain apparent defects in reproduction which were wholly beyond his control. A letter in reply to Mr. Burton was recently published in *Loudspeaker*, A. P. S. Chapter 7 organ and the source of Mr. Burton's statement, by Mr. Lester Cowan of the Academy of Motion Picture Arts and Sciences. This letter follows:

"I have read with interest your recent statement which discusses in a very sincere and direct manner the problem of placing responsibility for inefficiency or inadequacy with regard to quality of sound pictures as shown in the theatres.

#### An Important Point

"As spokesman for your fellow craftsmen you naturally resent any question or implied charge of inefficiency, and you feel it unfair that the projectionist, being last in line, should often have to personally assume the burden of responsibility for all the errors that have accumulated along the way in the course of production and handling of the film. I think you raise a very important point and one

in which the Academy, as I explained to your membership the other night, is vitally interested.

"Let us analyze the nature of our product from a technical standpoint. First of all, the quality of a sound picture must be in the original negative. If the director, cinematographer and associates do not succeed in getting quality into the negative, certainly none of the succeeding craftsmen can make much improvement. Assuming that this quality has been attained originally, then the responsibility of those who handle the film or record from there on is to maintain and preserve this quality as faithfully as they can, finally delivering it from the screen to the audience in the theatre. In this process the studio technician is concerned primarily with getting on to the negative, the laboratory in making prints which transmit this quality, the exchange in maintaining the film from a physical standpoint, and finally the projectionist in reproducing it in a manner that will deliver the best quality within the possibilities of his equipment.

"First, we must recognize the fact that the projectionist cannot go beyond the limitations of his equipment. Second, if he gets an inherently bad print which never should have been sent out or a print which has not been properly cared for he certainly cannot be expected to give the type of quality that one might hear from the first answer print run in the studio under ideal conditions.

#### Good Show the Problem

"So, all in all, we have the problem of giving the audience a good show



# Symposium on Wide Film Proportions

By FRED WESTERBERG

*Associate Technical Editor, International Photographer*

**U**PWARDS of 300 invited guests attended the meeting called at Fox Hills Studio on the night of September 17, by the Academy of Motion Picture Arts and Sciences, for the purpose of discussing the wide screen. The gathering was representative of the Hollywood motion picture industry and the exchange of views was most interesting, if not conclusive. Nugent H. Slaughter, sound expert at Warner Brothers, presided and under his direction the meeting moved off smoothly and without delay.

Douglas Shearer, sound technician and cameraman, spoke on the physical aspects of screen proportion, photography and sound in relation to a larger screen. He said that the need is not so much for larger figures on the screen as it is for more scope in their movements. He illustrated this by showing a drawing masked to a 3x4 proportion. By removing the mask additional space was shown without affecting the size of the picture. The pseudo-stereoscopic effect obtained on wide film was attributed to the wide angle of view.

## Measuring Grain

Some grain measurements were given. Mr. Shearer found that the average negative of .7 density contained 25 silver clusters to each square thousandth of an inch. Positive emulsion was found to have about 4 times as many clusters per unit area as negative film. Negative grain could be reduced, he said, by making a reduced print on 35 mm. film from a wide film negative.

If reduction prints were made, he said, there would be no need to make provision for a sound track on the wide negative film. This would permit a reduction to be made in the total width of the film.

Mr. Shearer doubted the value of a wider sound track than is now used. A gain of 6 decibells in volume would be obtained by doubling the area of the sound track, he said, but the ground noise would also be raised about 4 decibells, so the resulting gain of 2 decibells would hardly be worth the trouble and expense. He also said that the present speed of 90 feet per minute is sufficient to obtain a register of the highest audible frequencies and concluded, therefore, that any greater speed would be unnecessary.

## Wide Film Standards

Dr. Lee De Forrest spoke on standardization of wide film. He reviewed the activities of the sub-committee of the S.M.P.E. on standardization, of which he was a member. He cited some of the dimensions that had been

arrived at from an engineering point of view. He concluded by saying that the committee had gone as far as pos-

## "Realife" Wide Film

**R**EALIFE, Metro-Goldwyn-Mayer and Loew Theatres process for securing a wide film image (approximately a 42-foot picture), from standard size film, will be on display at the Capitol Theatre in New York City beginning October 17th. The process will be introduced in other Loew key theatres throughout the country before November 1st. After the process has been demonstrated for several weeks M-G-M and Loew officials will meet to decide definitely whether the process will be adopted as their official wide film program.

A desire to give the process actual field tests, where the quality of the picture, the functioning of the apparatus and the reaction of the public to the film may be gauged, makes it impossible at this time to secure definite details as to the technical aspects of the system. Such data as is available was presented in these columns recently under the heading "Wide Film vs. Wide Image on Standard Film," and there is nothing more in the way of concrete fact which may be had at this time.

Lester Isaac, Supervisor of Projection for Loew Theatres, Inc., has the following to say anent Realife: "We don't say that we have achieved absolutely the last word on the subject of wide film, nor do we say that we are unresponsive to other ideas on the subject. Realife represents some very serious work on the part of both the M-G-M and Loew Theatres technical forces, and it is our plan to first give the system a thorough test under actual field conditions.

"Our future course with respect to wide film will be based on the results of this series of tests. Full data on the process will be available when we are convinced that the plan is sound in all respects and merits the serious attention of the industry's technicians. Until that time we prefer not to discuss the Realife system."

sible and that it was up to the producers to come to some kind of a decision in regard to production requirements before any further progress could be made.

Karl Struss, cinematographer, spoke on the significance of screen proportion. He showed that a picture that is not wide enough often appears on the screen as a square due to the angle of projection, and sometimes even as a vertical picture, especially if viewed from the side of the house. Such a picture, he said, is very unsatisfactory from the audience standpoint and is one of the reasons why a wider screen proportion is needed.

Mr. Struss referred to the Gateway Theatre in Glendale, Calif., as an example of a theatre taking the bull by the horns, as it were, and giving the public a wide screen without the use of a wide film. This theatre, he said, which is typical of 90 per cent of the theatres in this country, simply puts in a matte .500x.800-inch instead of .600x.800-inch and by changing from a 4½-inch projection lens to one of 3½-inch focal length, obtains a picture reasonably free from grain on a screen 16½x26¼ feet, making full use of the available stage space.

## Struss Likes 3 x 5

Mr. Struss considered the 3x5 proportion of this screen as ideal. He pointed out that a 1x2 proportion as used at present on wide film, instead of giving larger full figures on the screen, in this case would present them 20 per cent. smaller since the maximum width of the stage was already being utilized.

Another point brought out by Mr. Struss was that the lack of height of the 1x2 proportion was keenly felt at times in striving for dramatic effect. He cited a case from one of his latest pictures where the headlight of an onrushing locomotive passed out of the top of the screen before the locomotive could get close enough to the camera to obtain the necessary effect.

J. O. Taylor reviewed his experiences in photographing six productions on wide film. He was heartily in favor of wide film as it now stands, 1x2 proportion and all. He cited such advantages as finer grain, greater depth of focus, larger figures on the screen and freedom from having to pan the camera.

Max Ree, art director, in speaking of screen proportion, discounted the artistic problem. Audience reaction, he said, must be kept in mind at all times. As an artist he favored the 3x4 proportion as offering the neces-



sary element of height and permitting a greater concentration of interest. But, he said, the possibilities of a wide screen for panoramas and spectacles where concentrated interest is not necessary should not be cast aside.

#### Suggests Flexible Screen

Mr. Ree favored a 3x5 proportion as a maximum in a wide picture. By having a screen of constant height that could be changed in width by the use of flippers he thought a better balance could be maintained between scenes meant to be merely impressive and those which demanded concentration of interest.

Ted Reed, sound expert, eulogized wide film and the 1x2 proportion. He did not believe, as one of the previous speakers did, that action on one side of the wide screen would go unnoticed when important action was in progress on the other side. He said the theatre had mastered this difficulty and thought the screen could do so likewise. He found that a wide sound track was a help in recording sound perspective.

Your correspondent was called on for a few remarks and managed to find voice to utter a thought or two on the need of fully investigating the possibilities of 35 mm. film as a vehicle for a wide screen picture. He said that area on the film is what we are fighting for in order to reduce the amount of magnification in the projected image. It was his contention that a 3x5 proportion conserves more area than the 1x2 proportion. In closing he expressed the hope that someone would invent a method of removing the sound track from the picture space where it is seriously impairing the ability of 35 mm. film to meet the increasing demands being made upon it.

Dr. L. M. Dieterich, scientist and consulting engineer, prefaced his remarks by saying that wide film is not yet an engineering problem. The first question to study, he said, is the esthetic reaction of the public. Service to the public demands that they be given a picture at which they will like to look.

Referring to the old masters of painting, Dr. Dieterich said he had found that the best of them found inspiration in contemplating nature, that consciously or unconsciously they were imbued with the spirit of dynamic symmetry. As evidence of this he pointed to the preponderance of the 1 to 1.618 or the 3x5 rectangle in classic art.

Effortless vision, the doctor said, embraces a field of view in binocular vision of 38 degrees on each side of the optical axis, 15 degrees above and 30 degrees below. In terms of a rectangle this gives a proportion of 3x5. In closing, he said that the first problem of wide film is to find a satisfactory proportion. Technique can come later.

Sergi Eisenstein, colorful Sovkino



Pres. Wm. F. Canavan, who is representing the I. A. at the A. F. of L. Convention in Boston

director, proved to be the spice of the program. He took it upon himself to rebuild nearly every argument that had been put forth. He was in rare form and his frequent coups were roundly applauded.

A horizontal picture, he said, is only 50 per cent. effective. Agricultural and other natural backgrounds require a horizontal picture, but the modern skyscraper needs a vertical picture to do it full justice. A crocodile, for instance, would also call for a horizontal picture, but a giraffe would certainly need vertical treatment as would a giant redwood tree. A square aperture that could be blocked out to any desired shape called for by the scene appealed to Mr. Eisenstein.

He characterized dynamic symmetry as a device to give life to an inanimate painting, but could see no reason for using dynamic symmetry on a screen that already has life and movement. Why use any of the laws of painting in composing a picture on the screen, he contended.

He thought it would be foolish to saddle the industry with a wide film based on the esthetics of the theatre when the screen is still groping for its own esthetics. He is evidently afraid that we are going to have a white elephant on our hands.

In response to Dr. Dieterich's effortless vision argument, Mr. Eisenstein brought forth the fact that although the eyes move easier in a horizontal direction this is more than offset by the neck, which can be moved more readily in a vertical direction. Mr. Reed broke in to check and double check this statement by demonstrating how easy it is to nod the head and say "yes," especially in Hollywood.

Mr. Eisenstein concluded by saying how nice it would be to be able to play not only with the story and the cutting of the film but also with a screen that could be made to take any desired shape as the story progressed.

Dr. Metfessel, professor of psychology, was the next to speak.

He questioned the esthetic value of the so-called golden section or 3x5 proportion. An early questionnaire, he said, gave this proportion a vote of 35 per cent, which was more than any other shape received; but Valentine in 1900 found in another questionnaire that any rectangle was then considered esthetically sound, except a square.

The doctor brought out the fact that the eye can only concentrate on form near the center of vision, that on the sides it is only sensitive to movement. He also said that we have become so accustomed to stereoscopic vision that we are capable of seeing depth even with one eye under natural conditions. One of these natural conditions is that we do not see things with a border. A large wide picture on the screen, he concluded, approximates natural conditions in that we are not so aware of the border.

#### Dubray Favors 3 x 5

Joseph Dubray, motion picture engineer and erstwhile cameraman, paid tribute in his opening remarks to the Academy of Motion Picture Arts and Sciences for its work in bringing the industry together in a concerted effort to solve the wide film problem.

Mr. Dubray stated he had found an apparent trend in Hollywood toward the opinion that the 1x2 proportion is neither pretty nor desirable. With this opinion he was in agreement. He told that from an engineering standpoint research had proved that film based on a 3x5 picture proportion was more easily handled than film based on a picture proportion of 1x2.

Possibilities of a flexible screen were discounted by Mr. Dubray on account of the control already exercised by the cameramen in the use of making pieces on the set and vignettes in the camera. Mr. Dubray heartily indorsed wide film, but stressed the mechanical superiority of a film having a picture proportion of 3x5.

#### Some Cost Estimates

Mr. Shearer spoke again, saying that any wide film proposals would be subservient to the requirements of commerce.

He cited the fact that it would cost about \$40,000,000 to change the projection machines in this country to take wide film and that release prints alone on wide film would entail a cost of about \$20,000,000 yearly. Production costs, he said, would be relatively small. He recommended that consideration be given to the idea of printing from a wide film negative to standard positive by optical reduction. The results so far obtained were very promising, he said.

In closing the meeting the chairman, Nugent Slaughter, voiced the opinion that all those who had come with preconceived notions in regard to wide film must have had many of these notions upset.



# As *The* EDITOR Sees IT

## ¶ *The New Changeover Standard*

A DETAILED exposition of a new changeover standard which becomes effective on November 1 appears elsewhere in this issue and is accompanied by appropriate supplementary comment on its technical phases. What we wish to discuss here are the broader aspects of the standard and its important bearing on the future well-being of the motion picture industry. From a purely technical standpoint the plan may or may not prove adequate, but this is a point the answer to which will have to await the passing of at least three months. To our mind the most interesting angle to the story of the promulgation of this new standard is not *what* was done but the manner of its doing.

Having its inception in the Academy of Motion Picture Arts and Sciences, this plan has had the coordinated attention of every technical branch of the industry. Producer representatives, film manufacturers, studio technicians, laboratory workers, exchangemen, exhibitors, and projectionists,—all have been afforded the opportunity to express their views on the plan, and the standard finally agreed upon represents the consensus of opinion among these groups. Where is there anyone who can come forward and point to any previous similar occurrence, any such splendid example of cooperation in the motion picture business?

We think there will be no answer to this question. Certainly it is a fine thing that millions of dollars are to be saved the industry, that in every theatre in the land a smoother performance will result from changeover uniformity, and that the days of buck-passing in the matter of mutilated film are definitely behind us. But isn't it a finer thing that at last it has been demonstrated that there can be coordination among the various groups within the industry, each with their own special interests to guard, their own work to be made easier? We think it is; and we see in this splendid work among the industry's technical forces an object lesson to the other branches.

## ¶ *Chaos*

WE thought the high-water mark for stupidity had been established in so far as the motion picture business was concerned with the recent muddle over sound picture interchangeability, but we are forced to the conclusion that we were wrong—dead wrong. The present state of affairs in connection with the introduction of wide film—that great big box-office tonic about which producers talk so much and display such a lamentable ignorance—so far surpasses in degree the sad affair of interchangeability that there really is no room for comparison. Just witness the present state of affairs in connection with wide film: Mr. X, secure in his position as a motion picture “executive” and inflated to a hitherto unbelievable girth by the babel of “yeses” on the part of

his “technicians” (not to mention a covert desire to pep up a falling stock market),—Mr. X has decided to use 70 mm.; Mr. Y, under the spell of similar influences, is absolutely set on 65 mm.; while Mr. Z just dotes on 56 mm. But Mr. A is certain that “shooting” on 70 and subsequently reducing the picture in printing to 35 mm. is the answer to the problem; and Mr. B disdains all these processes to further his own idea of merely magnifying a standard 35 mm. image. What does it matter that millions are at stake, and that the answer to the problem may be had as a result of a little hard work? Haven't the Messrs. X, Y, Z, A and B proved their right to be considered modern Merlins—and certainly in “show business”? Why, of course.

Why, of course not! We are firm believers in the efficacy of teamwork, and we despise chronic knockers, but the present situation with regard to wide film standards is nothing short of disgusting. Let it be recorded here in cold type that the aforementioned gentlemen are heading for a fall, and a hard one. Incredible though it may seem, the costly lessons of sound pictures are forgotten—we wonder for how long? The key to the situation is the individual theatre projection room which, as with sound, is expected to produce the answer to all knotty problems—possibly from out of a silk hat. The first consideration should be accorded reproduction, but it inevitably is thought of last. Attachments! attachments!—there is magic in those words for those bedeviled with a knotty technical problem; but just a few more attachments will see the projector collapse of its own dead weight.

What sane influence can be brought to bear to stem this mad rush? Is there no responsible agency within the industry that can assume the task with some promise of success? Or shall we know the answer only when it is too late?

## ¶ *S. M. P. E.'s 28th Meeting*

CONGRATULATIONS on past achievement and well wishes for future progress are in order for the Society of Motion Picture Engineers on the eve of its forthcoming Fall Meeting in New York, the 28th get-together of its existence. Demonstrating its stability in sound achievement, which is reflected in a constantly growing membership, the Society now is truly representative of the motion picture industry with its many inter-related yet diversified fields of effort. It occurs to us that one of the most important functions of the Society just now is the preservation of its identity as a *motion picture* technical organization, with motion pictures, *per se*, its prime concern, and its administration in control of motion picture men. With this set-up assured, the Society will go far along the road on which it originally set out.

We feel sure that this the 28th meeting of the Society will be equally productive of benefit to the industry as have the preceding conventions.



# Efficient Sound Reproduction

By R. H. McCULLOUGH

*Supervisor of Projection, Fox West Coast Theatres*

THE presentation of "The Big Trail" at the Chinese Theatre, Hollywood, has given new impetus and added interest to the motion picture industry. For years, motion picture exhibitors, producers, as well as engineers, have had the ideal of a larger projected image, as well as a larger photographed image. Grandeur is double the width of the standard film, which provides a greater scope for group action. The tendency with the 35 mm. film to pack the screen with actors, shoulder to shoulder, has imparted an aggravating monotony to motion picture patrons. Grandeur offers a series of spectacular surprises in photography to theatre patrons.

The proportion of the Grandeur picture (one to two dimension) is very close to the normal angle of vision, which seems imminent as a standard proportion for the wide film projected image. Grandeur film has an important feature, due to the larger image upon the film and the grain is not so apparent on the screen as it is with the 35 mm. film when projecting Magnascope, which is merely magnification.

## Wider Track Desirable

Sound, which has made the motion picture vibrant with music and speech, is greatly improved with the Grandeur sound track, which permits



R. H. McCullough

a much greater volume-range in recording, and correspondingly greater volume and tone quality in reproduction. A few years ago, when the sound track was added to the motion picture film, it was found that the picture area did not allow enough characters to be included in a scene. To meet this situation and to improve conditions, the Fox Film Company started to work on the development of the wide film, which finally resulted in the Grandeur proportion.

Projection offers plenty of difficulty with short throws (distance between the projection screen and objective

lens), when it is desired to obtain a picture of satisfactory width. At the present time, there are no lenses which can be secured under four inch equivalent focal length, which will give satisfactory results with Grandeur.

## Special Lens Needed

An ordinary projection lens is entirely out of question, except in the longest focal lengths, because of objectionable curvature of field. It is necessary to use anastigmat lenses to obtain good definition, because of the wide angle. It is also necessary that the objective lens rear combination be of sufficient diameter, so as to collect the area of light rays from the aperture—otherwise, loss of illumination will result at the sides of the projected image, which will be apparent by shadows.

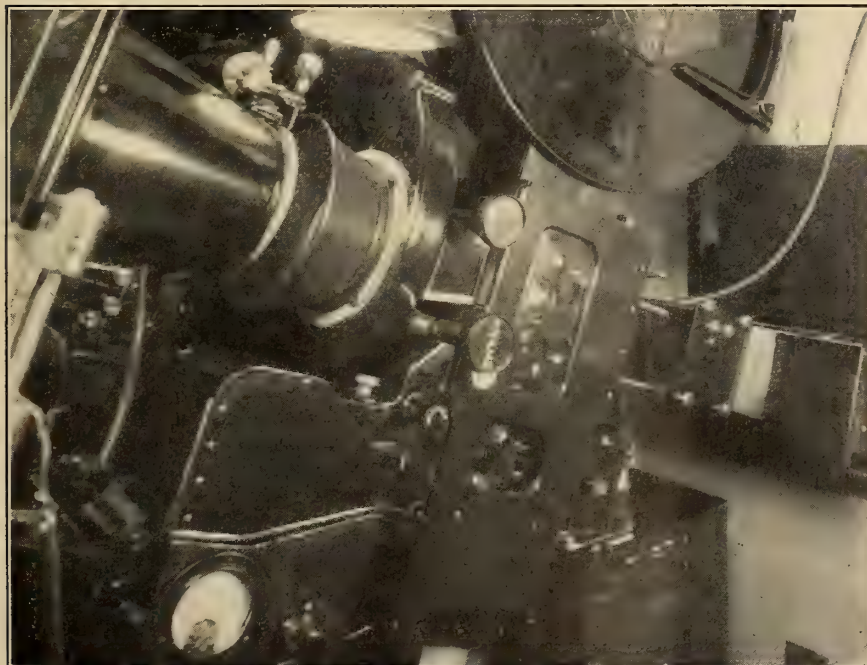
The better the definition of the Grandeur picture, the closer the front seats can be to the screen. If the Grandeur picture image is increased over fifty feet in length, magnification will result, which will spoil the illusion of objects. Where Grandeur is projected at an angle of more than 15 degrees, it is necessary to use prisms to reduce the vertical distortion to a minimum, so as to reduce the elongation of objects, which is very objectionable when viewing the picture from the side seats.

## Problem of Illumination

It is imperative that the Grandeur screen be well illuminated. At the present time, there are no carbons manufactured to permit using over 170 amperes at the projector arc. Approximately 13 foot candles of illumination is required for satisfactory projection. Super-Hi-Intensity Lamps must be used to obtain the correct amount of illumination. With the Grandeur aperture 1.768 x .885, and by using the ordinary 4½ in. plano-convex condenser combination, the illumination area is greatly reduced when the area of the aperture is circumscribed.

It is obvious that if the same amount of light, which passes through the aperture in an ordinary projector, be spread over a screen area twice as large the screen illumination would only be half as great.

One obvious means of increasing the illumination is to employ condenser lenses of larger converging angle. About 25 per cent more illumination can be obtained if the rear condenser lens (next to arc), has a cylindrical surface. Such a condenser will yield an elongated spot of light



Side view of Grandeur projector mechanism. Note the prisms which are mounted in front of mechanism for the purpose of eliminating vertical distortion occasioned by the 23° projection angle



equal to that of the rectangle, without loss of light.

It has been indicated that the relatively enormous picture on the screen may prove more satisfactory at a level of brightness lower than we have been accustomed to with the standard picture size—however, with the facts at hand concerning this matter, the requirements for illumination of the *Grandeur* picture is similar for the illumination required for the standard size picture.

### Fader Contacts

One of the most important points of the sound reproducing system is the fader or in other words the volume control. When it is realized that a resistance of thousands of ohms is required for distortionless volume control, and that an amplification of thousands of times takes place between the circuit and the powerful loud speakers, it stands to reason that the slightest uncertainty of contact causes tremendous noises.

Fader contacts should be inspected quite frequently. When fader contacts become dirty, noises will be perceptible on change-overs, and when increasing or decreasing the volume. Clean fader contacts with a soft rag dampened with carbona; and after cleaning they should be polished with embossed paper and a very small amount of vaseline applied to the contacts, which will help ease the operations and besides will help to keep the contacts from becoming corroded.

### 41-A Amplifier

The 41-A amplifier is a first stage or speech amplifier with the filaments of three 239-A vacuum tubes connected in series. If this amplifier ceases to function, one of the first things to look for is a burned out vacuum tube. A gain control is inserted across the secondary of the input transformer, the variable arm of which is connected to the grid of the first 239-A tube.

A second means of controlling the gain of this amplifier is inserted in the grid circuit of the second tube. The filament current value should always be approximately 270 milliamperes. Very little trouble has been encountered with this amplifier. However there are a few things which I do believe every projectionist should be familiar with to locate certain troubles. The voltage supply for the plate circuit is obtained from the 42-A, which is the following amplifier, and which has its own rectifier.

#### 239-A Tube Test

The 239-A vacuum tubes which are employed in the photo-electric cell and 41-A amplifier can be tested in the first socket of the 41-A amplifier. Before testing these tubes, be positively sure that all currents and voltages of the system are adjusted to their normal operating values. Place the tube, to be tested, in the first socket of the 41-A amplifier. Press the plate current button and vary the

### Believe it or Not—

Censorship deletions on film-disc releases make possible the recording of this new demonstration of managerial deference to the almighty projectionist. At the Fox Japanese Garden Theatre in New York were received recently several disc releases the reproduction of which was marred by censorship cuts, which means of course the bringing down of the fader on those portions of dialogue which are considered objectionable. This means action but no sound.

Greatly perturbed at the prospect of much unfavorable criticism accruing to the theatre's projectionists as a result of these vocal lapses, assistant manager A. B. Daniel went into a huddle with manager J. Salmon (their names really deserve to be printed). Result: just before that particular subject was screened Mr. A. B. Daniel advanced to the stage and assured the audience that the defects in reproduction were no fault of the projectionist but were the result of censorship deletions! One gold medal, please.

filament current, between the limits of 220 milliamperes and 270 milliamperes. Any 239-A tube falling below 1.3-5 or beyond 1.6-5 milliamperes should be replaced.

A 21 CB 1 microfarad condenser, identified as C-11, is placed across the 390 volt leads (the rectified plate supply from the 42-A amplifier to the 41-A), and also a 109-B choke coil identified as L1 is connected in series with the positive lead. If condenser C11 should become shorted, no plate current could be obtained at any of the tubes. A likewise result will be encountered if choke coil L1 becomes shorted.

Should the supply plate voltage be above 390 volts, a high plate current reading will result—if below, a low plate current reading will result. If the plate current of any individual tube varies above or below the normal operating values, replace it with another and if the values are still off, the trouble can be traced to one of the component parts or the wiring.

#### Condenser Troubles

The inside of filtering condensers, such as is used in sound reproducing equipment, consists of many layers of aluminum sheets spaced with tissue paper. I have found that excessive temperature will cause these condensers to dry out, which on a few occasions have resulted in not properly filtering the rectified current, and a hum was encountered. Upon replacing the condenser the hum was eliminated.

An open circuit in any of the grid circuit stages in this amplifier will cause a hum, which will be very perceptible in the reproduction. A shorted condenser between the plate of V1 and the grid of V2, or a shorted condenser between the plate of V2 and the grid of V3 will cause this trouble. Should C1 condenser become shorted, the plate current reading on the V1 tube will be exceedingly high.

#### "B" Batteries

The problems and troubles encountered with dry "B" batteries have been mentioned in preceding articles. A theatre recently ran the show on one projector because crackling and popping noises were encountered with one of the photo-electric cell amplifiers emanating from a defective "B" battery. I have pointed out many times the troubles which can be expected from dry "B" batteries. Noises, such as crackling and popping, may be attributable to a poorly soldered joint between the cell connectors and cell terminals. This trouble may even exist in a new battery used only a few hours, which was still in good condition when tested by the projectionist.

Noise in "B" batteries can also be caused by fluctuations in voltage, resulting from poor or defective cell insulation. Leads attached to the spring terminal clips, at the top of the dry "B" battery, should always be soldered, so as to insure a good tight connection at this point. There is positively no excuse for running the show on one projector when one photo-electric cell amplifier is in good condition.

#### Have Pair of Leads

A pair of leads should always be kept on hand with small spring clips, and a small cut-out switch, so that a temporary hook-up can be made from one photo-electric cell amplifier to the other. It should be remembered that two photo-electric cells can be used when one P. E. C. amplifier is in good condition, and that a continuous sound-on-film show is possible. Long waits and interruptions must be avoided.

#### Warner Wide Film Head

Warner Brothers engineers have about completed work on the new wide film projector head on which they have been experimenting for some time past. Like the new *Grandeur* apparatus, it permits use of both wide and 35 mm. film. The changeover on the Warner machine can be made in a matter of a few minutes merely by switching the aperture plate and lens.

#### "Vitascope" Trade Name

The Warner projector for wide film is contained entirely in a specially designed head which replaces the 35 mm. head now in use. It is the intention of Warner Brothers to market it under the trade name of "Vitascope."



# Why and How of Continuous Projection

By ARTHUR J. HOLMAN

*Continuous projection has been little more than a phrase heretofore in the motion picture industry, but in this the third of a series of articles on the subject Mr. Holman explains the why and how of this most interesting of projection topics and brings into bold relief many points heretofore treated only in the vaguest manner. We consider Mr. Holman's contributions on this subject a most valuable addition to motion picture technical literature.—THE EDITOR.*

THE term "continuous projection" is applied generally to any process for exhibiting motion pictures which does not require intermittent movement of the film. That is to say, any projecting device, provided either with variable reflecting or refracting elements, which functions with a continuous movement of the film across its aperture plate, is nominally considered a continuous projector regardless of whether it may require a shutter to cut-off travel ghost during all or part of the transition. As a matter of fact, the real criterion for continuous projection is not, per se, continuous film movement but rather continuous non-periodic screen illumination, and this can be provided only by complete elimination of all shutter effect. It is evident, therefore, that the main purpose of continuous projection is to completely eliminate the shutter, for herein lies the chief advantage of non-intermittent projection. Strictly speaking, no device should be classified as a con-

tinuous projector unless it provides a transition between film frames which is so exactly correct that it does not change the intensity of the screen illumination or mar the definition of the screen image.

It is not difficult to see how a mirror system might be capable of meeting these requirements, at least in theory, provided it were possible to secure the exactly correct orientation of the mirrors throughout the complete picture cycle. On the other hand, the theory of the movable lens system is less obvious, so it will be the purpose of this article to describe how and why it functions. Once the basic principle is understood, the modus operandi of the lens wheel system is as easy to visualize as that of the mirror system.

## Lens Characteristics

We will begin the analysis by reviewing a little physics. Any homogeneous transparent substance having a pair of opposite highly polished spherical surfaces is called a lens. In motion picture work, all lens are made of optical glass. Lenses are classified as positive or negative according as they are thicker at the middle or at the periphery, regardless of the curvatures of their surfaces. On looking through any lens held at arm's length, or whatever distance is necessary to get a good focus, at some horizontal line such as a window sill or the roof of a building, one immediately observes a very important characteristic of all lenses. If the

lens is held at its top and bottom edges in such a manner that the horizontal line under observation is visible to the eye beyond each side of the lens as well as through it, it will be noticed, on moving the lens up and down slightly, that there is one position in which the horizontal line will appear straight and unbroken at the edges of the lens.

If a positive lens, thus held, is moved slightly downward, the portion of the horizontal line visible through the lens will appear to be elevated, and if the lens is moved upward, the line will appear to be depressed. If the lens is negative, the apparent displacement of the line is in the direction the lens is moved, but, in any case, the apparent displacements are proportional to the movement of the lens. When the horizontal line, visible beyond each edge of the lens, appears unbroken at the edges of the lens, the line appearing in the lens passes through a very interesting and important point called the optical center of the lens.

To state the law of physics governing the case; there is no apparent displacement of a line when it is viewed through the optical center of the lens, but when viewed through the lens in any other position, its apparent displacement is proportional to the displacement of the optical center of the lens from its centered position on the line. In other words, any lens provides a prismatic or bending effect which is directly proportional to the decentration of the lens. This law has been known to opticians for many years and the principle has long been applied in spectacle work. It is interesting to note that this fundamental characteristic of all lenses is the basic principle whereon the revolving lens wheel system of continuous projection operates.

When this characteristic of a lens is fully realized, it is not so difficult to understand that it might easily be possible to so move an objective that a stationary screen image could be obtained from any one film frame moving across an aperture plate provided the required relationship between the film frame movement and objective movement was maintained.

The first thing to be noted, is that the film frame movement and the objective movement are, in general, along a straight line, i.e., there is no turning or twisting movement involved as is the case with a mirror system. Moreover, if it were possible to bring along a complete objective with each film frame as it crossed the aperture plate, and each new objective coming into action was so aligned that

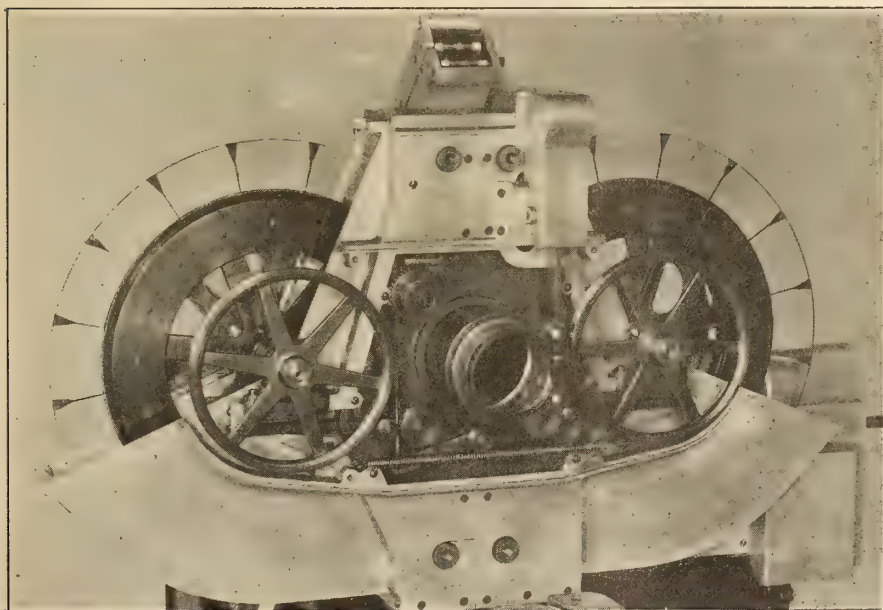


Fig. 1—Front view of mechanism with cover plates removed, showing lens wheels, brake wheels, balanced drag mechanism, and mount for front elements of objective



it would exactly superimpose the image of its respective film frame upon the image of the film frame preceding it across the aperture plate, it is not hard to see that it might be possible to accomplish the transition between film frames without using a shutter. But such a series of complete objectives would necessarily be small in diameter and therefore, could not possibly transmit the required screen illumination, moreover the supporting structures themselves would act as shutters as they crossed the light beam transmitted through the film by the condenser system. Invention was required to make practical application of the principle.

Other things being equal, objectives transmit light in proportion to their *f* values—i.e., focal length divided by effective aperture—hence any new objective system, if it is to have equal light transmitting efficiency, must be capable of working at the customary effective aperture. Incidentally, this involves one of the most difficult problems that a continuous projector designer has to face. Fortunately, however, it is possible to get the full effect of the basic principle by moving only the rear elements of the objective, the front element remaining stationary on the principal axis of the projector. This arrangement not only provides normal light transmitting efficiency but also makes it practical to eliminate all shutter effect due to supporting structures.

It will be observed from the accompanying illustration (Fig. 1) of the mechanism, that the lens elements on the lens wheels are so shaped and supported that, as the lens wheels rotate, no opaque structures (excepting the very small opaque patches over the outer radial edges), traverse the light beam which is transmitted through the film by the condenser system.

The relative refractive powers of the front and rear elements of the objective, as well as their relative positions with respect to the aperture plate, are determined by known physical laws which must be satisfied in order to secure exact superimposition upon the screen of images of adjacent film frames during the transition. The dissolving action, taking place during the transition, occurs in the following manner. Inasmuch as the dissolve occupies a large portion of the picture cycle, it is necessary that the aperture in the aperture plate be approximately three frames high and the condenser system must be so designed that the elongated aperture is not only fully and uniformly illuminated without excessive loss of light on the sides, but in addition, all light passing through the aperture must converge into a beam of relatively small circular cross-section where it passes through the revolving lens wheels.

Let us consider first the instant when a film frame is exactly centered

(Continued on page 31)

## Sound Projection Defects

Listed below are major sound projection defects which are occurring in Publix Theatre operations every day. The corresponding causes are given. Remedies are obvious. They should be applied at once wherever defects exist. Such an important phase of successful theatre operation must be carefully handled at all times.

- I. To avoid interruptions, the result of defects insists on cleanliness in:
    1. Fader
    2. Exciting lamp
    3. Photo-electric cell
    4. Batteries
    5. Sound gate, etc.
  - II. Common defects and their causes:
    1. FLUTTER (undulating sound)
 

*Causes*

      - a. Dirt on sound gate
      - b. Worn sound sprocket
      - c. Bad record (warped, etc.)
      - d. Oil on sound track
      - e. Dirt on sound sprocket
      - f. Failure to close 1A unit door
      - g. Slipping of lower magazine take-up
      - h. Film tension pad out of adjustment
      - j. Turntable out of alignment
      - k. Loose take-up chain
    2. LOSS OF VOLUME
 

*Causes*

      - a. Dirty optical train lens
      - b. Blackened exciting lamp
      - c. Sagging filament in exciting lamp
      - d. Defective photo-electric cell
      - e. Soft tone needle used
      - f. Worn record
      - g. Thumbmarks on PEC window or exciting lamp
      - h. PEC window out of line
      - j. Exciting lamp filament out of focus
      - k. Current on exciting lamp too low.  
(Step up current on rheostat)
      - l. Low B battery voltage
      - m. Dirty sound aperture
      - n. Defective tubes
      - o. Dirty contact points on fader
      - p. Bad connecting plugs to horn units
      - q. Disconnected plug at horn units
    3. BELL NOISES:
 

*Cause*

      - o. Defective microphonic tube (test with fingernail)
    4. HUM:
 

*Causes*

      - a. Frame of projector not grounded
      - b. Motor control box not grounded
      - c. A.C. lines too close to speech units
    5. PERIODIC SOUND:
 

*Causes*

      - a. Warped record
      - b. Dirt on turntable
      - c. Turntable out of line
    6. RIPPING SOUND:
 

*Causes*

      - a. Needle jumps groove
      - b. Dirt on record
      - c. Cut grooves in sound track
      - d. Loose wires at connections
    7. OFF PITCH SOUND:
 

*Causes*

      - a. Running above or below synchronized speed of 90 ft. per minute
      - b. Dirty contact on machine motor commutators
      - c. Defective tubes in control box
    8. CRACKLING, FRYING SOUND:
      - a. Defective tubes, exciting lamp, PEC
      - b. Defective batteries
      - c. Dirty battery terminals
      - d. Loose connections
      - e. Vacuum tube loose in socket
      - f. Dirt on end of lens tube
      - g. Dirt on sound track
    9. OVERLOAD DISTORTION:
 

*Causes*

Excessive volume caused by:

      - a. Gain control out of order
      - b. Fader setting too high
    10. OUT OF SYNCHRONISM:
 

*Causes*

      - a. Improper loop
      - b. Improper framing at start (disc)
      - c. Improper reproducer position at start (disc.)
      - d. Reproducer arm stuck at holder
      - e. Failure to insert proper number of frames of blank film (disc)
      - f. Record not clamped on turntable
    11. MOTOR BOAT SOUND:
 

*Cause*

      - a. Improper adjustment of film guide roller
    12. CHANGE IN PITCH AT CHANGE-OVER:
 

*Cause*

      - a. Defective motor box control
    13. CHANGE IN VOLUME AT CHANGE-OVER:
 

*Cause*

      - a. Attenuators improperly balanced
      - b. Exciting lamps or PECs not matched
- VOLUME TOO LOUD OR TOO WEAK IN CERTAIN AREAS INDICATES WRONG HORN POINTING.



## New Power's Front Plate with Lateral Lens Adjustment

**T**O fill a long felt want on the part of the users of Power's Projectors, thousands of which are equipped with some type of sound equipment, the International Projector Corporation takes pleasure in announcing two new assemblies which greatly facilitate the manipulation of lenses and apertures and, consequently, make for a marked improvement in projection where Power's Projectors are used.

The Power's front plate assembly shown in the accompanying cut is designed along the lines of the former type which has given universal satisfaction wherever used, but many features have been added thereto which will at once appeal to the projectionist as a marked and up-to-date improvement in construction.

### Instantaneous Change Possible

Practically an instantaneous change of lenses is now possible with this new unit, and a lens centering device has been added, making it possible to center the projected picture on the screen when sound-on-film is used. The instantaneous lens change feature allows the use of the proportional type aperture plate and a shorter focal length lens so that the projected picture with sound-on-film may be increased in dimensions to meet the dimensions of the silent or sound-on-disk prints.

Another excellent feature of construction, which will appeal to all progressive projectionists, is the elimination of the old type rack and pinion lens focusing adjustment and the substitution therefor of the micrometer type of focusing pinion which allows

the accurate adjustment of the lens and eliminates the possibility of the lens jarring out of focus at any time during projection.

A new type framing lamp assembly has been incorporated in this new device and which may be instantly removed for lamp replacement when necessary. The pull chain for the lamp socket is readily accessible to light the framing lamp when threading the projector.

A reference to the lettered photograph, Figure 2, in connection with the following data will explain the operation of this equipment.

A is the front plate which attaches to the Power's mechanism in a similar manner to all previous types.

B is the lens mount and focusing assembly attached to the front plate A.

Lenses are securely clamped in this mount by locking screw C.

D is the lateral lens adjustment by means of which the picture is cen-



Figure 1

tered on the film and screen when changing from silent or sound-on-disk

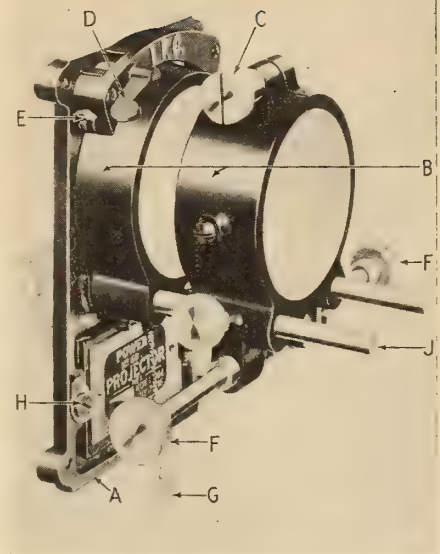


Figure 2

to sound-on-film with either the proportional or regular sound aperture.

E is an adjustable stop for determining the lateral throw of the lens. This stop is adjusted when the installation of the assembly is made and remains fixed thereafter for any given focal length of lens. The two knobs F are attached to the micrometer focusing device and, as will be noted, may be operated from either side of the projector.

G is the pull chain for the framing lamp and H is the framing lamp assembly latch, one of which is attached to either side of the assembly so that the instant removal of the framing lamp assembly may be readily accomplished without interference with any other part of the unit.

Figure 1 shows a fixed focus collar, similar to that used on the Super Simplex Projector, by means of which lenses may be instantly snapped into focus where quick lens changes are necessary.

The hole G, Figure 1, in the collar slips over rod J, Figure 2, and thereby accurately locates the lens rotationally so that the picture is always in the same place on the screen regardless of how many times the lens may be removed and replaced.

Where lenses do not project far enough beyond the lens mount B to allow this fixed focus clamp may be readily attached, many of the lens extension attachments used in connection with lenses on Super Simplex Projectors may be used. Data on these various assemblies will be furnished on request.

### Power's Aperture Change Assembly for Sound Projection

This new assembly is shown in Figure 3 and very little explanation is needed to convince the projectionist that he can work far more efficiently with this assembly attached to his Power's Projector and particularly

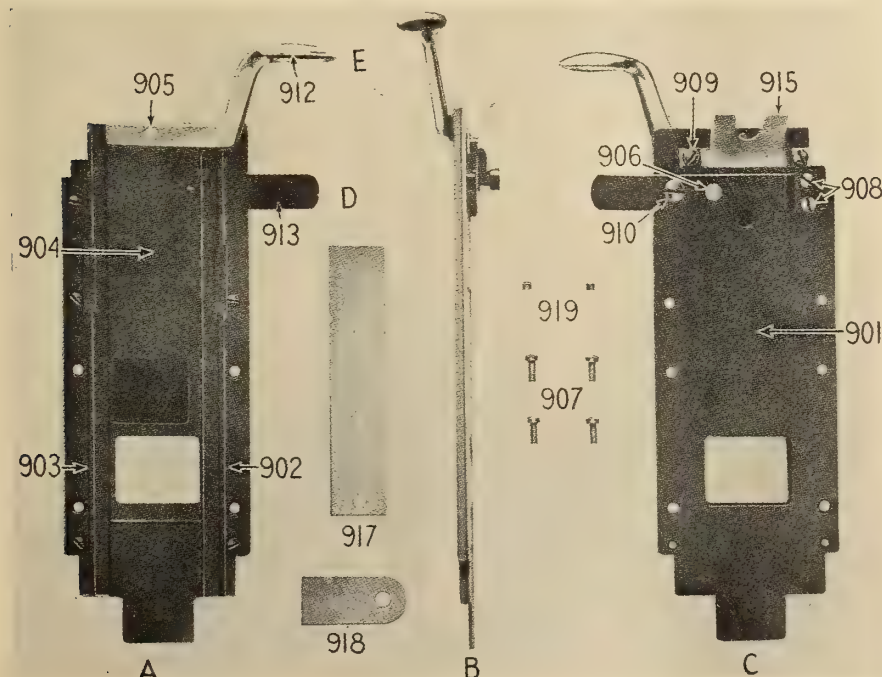


Figure 3



when it is used in connection with the new front plate assembly previously described.

A shows the front view, B the end view and C the rear view of this assembly. It may be readily attached to all existing Power's Projectors as may the Power's front plate assembly. It has been so designed that it may be readily used in connection with the Power's old type gate although it obviously would be more efficient when used in connection with the Power's new style gate assembly, data covering which may be obtained from any office of the National Theatre Supply Co. or direct from the factory at 90 Gold St., New York City. This aperture assembly is furnished with the standard silent or sound-on-disc aperture and the standard sound aperture or the proportional type sound aperture as desired. Complete instructions for attaching it to Power's Projectors are furnished with each assembly, and it may be easily attached by the projectionist in the space of a few minutes.

The aperture plate in the assembly

slides vertically in two guides and is rigidly locked in whichever position it is being used. A slight pressure on locking spring D with the thumb and a downward pressure on lever E with the forefinger brings the sound aperture into position.

When the sound-on-disc or silent aperture is desired, all that is necessary is simply to push up on lever E, no pressure then being required on locking spring D.

When using the proportional aperture it is necessary to change lenses or use lenses of the bifocal type so that a shorter focus may be obtained in order to bring the projected picture up to the standard size of the picture projected through the silent or sound-on-disc aperture.

These two units will undoubtedly appeal to every projectionist and no time should be lost in equipping existing projectors with these modern means of acquiring superior projection and, incidentally, eliminating a great deal of the inconvenience formerly experienced where sound-on-film and sound-on-disc is used.

## Rest and Relaxation

By H. E. Kleinschmidt, M. D.

OF the many remedies in Nature's medicine chest, the commonest, and perhaps the most useful, is rest. Almost all disorders of the body make us feel "sick" and warn us to lie down. Sometimes, the demand for rest is so insistent that we are overpowered by unconsciousness, but more often the hint is a more gentle one which we too often tend to disregard. For example, people speak of "fighting a cold," by which they mean keeping up their usual activities to the last ditch. It is not inconsistent nor a surrender to fight a cold by resting, for by so doing we conserve bodily energy which may then be spent in overcoming the germs that are causing the cold.

Tuberculosis is one of those diseases that responds to rest. Here, two factors play a part. The lung tissue is diseased; it needs rest to recover. But every motion of the lung stirs up the injured tissue. Exercise, mental labor, emotional stimulation, in fact, anything which speeds up bodily activity increases the work of the lungs and thus gives them no chance to heal.

The other factor has to do with what is called intoxication. In tuberculosis, as in many other diseases, certain poisons are excreted by the diseased tissue. These poisons, or toxins, are absorbed into the blood and give rise to fever, exhaustion, lack of appetite, discomfort, and other distressing symptoms so well known to the consumptive. Every activity of the body increases this absorption, while complete bodily rest lessens it

and so gives the entire body a chance to increase its healing powers. Experience backed by sound science has taught us that rest of body, mind, and emotions, as nearly as that is possible, is the most necessary element in the cure of tuberculosis.

### Proper Rest Most Important

Even in early states of the disease, comparative rest is the best method we know of to prevent its further progress. There are many children whose lungs have been invaded by the tubercle bacillus and who have suffered some slight damage—so slight, in fact, that there are no symptoms and the child may appear as healthy and rosy as any other. Only by means of the tuberculin test and the X-ray, which pictures the slight damage, can the diagnosis be made.

These children are not sick in the usual sense, but if, as they grow older, they are subjected to strain, the resistance of the body, which has thus far held the disease in check, may be so depleted that the sparks of the disease are easily fanned into a flame and then consumption develops. That happens frequently during adolescence, when parental control is lessened, when boys and girls become absorbed in their studies and sports and dances, and when the rapid transition from child into adult makes unusual demands on the body.

### Xmas Seals Pay the Bill

Tuberculosis associations throughout the country have this year, by means of a vigorous campaign, brought to the attention of parents

and teachers the necessity of finding out whether the sparks of the disease are already in the young child's body. During 1931, these associations propose to follow up this good work by bringing to the attention of older boys and girls and their elders the danger of overstrain, especially to those youngsters who already have the germs in their bodies. The slogan of this campaign will be, "Tuberculosis, the Foe of Youth." Posters, leaflets, motion pictures, lectures and numerous other means will be employed to sound this note. The work is to be financed by the sale of Christmas seals.

### Cost to Wage Earners

According to a survey made by the U. S. Bureau of Labor Statistics a few years ago, two per cent of the American population is sick at any given time. The cost of this sickness aggregates the total of more than two billion dollars every year.

Since this survey, another made by a life insurance company shows that approximately \$80 per year is spent by each wage-earner's family as the cost of sickness. This amount would not seem to be excessive—if it could be safely assumed that eighty dollars would cover the cost of all sickness from which the family might suffer. Unfortunately, no family can arbitrarily fix any given sum to be spent. Ill health and its attendant medical attention may not be the only items to make inroads upon the family's "sick budget." A large dental job may present itself; a major operation may suddenly be required, or a contagious disease may infect some or all of the family—then where does the eighty dollar budget come in?

An average of \$80 for a sick budget represents a combination of larger and smaller amounts that vary from next to nothing to thousands of dollars per year. So long as sickness expenditures do not exceed the eighty dollars, so long can the budget hold its own. When it exceeds that amount trouble begins—for that family. They are either forced to go into debt, or accept charity. The latter is something nobody cares to do, so it often happens that the family resort to quackery, patent medicines or do without medical attention entirely.

### 20-Year Records of Progress

Tuberculosis, alone, is responsible for a death rate that is from eight to twelve times higher among certain industrial workers than it is among farmers, for example. As menacing as these figures sound—and, in reality, are—the tuberculosis death rate has been declining since those statistics were compiled a few years ago. It is still altogether too high, (79 out of every 100,000 persons) and tuberculosis still kills more persons between 18 and 40 than any other disease. At the same time, the rate has been cut in half in the last 20 years.



## Review

*Our Review Department inaugurated with the last issue met with a fine reception on the part of our readers and elicited much correspondence suggesting matter for review. It is our intention to include a wide variety of topics in this department with sound pictures to receive its due share of attention but no more. Some readers were under the erroneous impression that this department would be devoted exclusively to sound picture data, but this month's department will serve to dispel such thoughts. Film mutilation is a pertinent topic just now, and because of the elementary nature of the information presented this month we feel that it will be very welcome.—The Editor.*

### How to Prevent Film Mutilation

By Eastman Kodak Company

EVERY year the loss through needless film mutilation runs into staggering sums and of course someone has to pay the bill. There are several contributing causes to this waste, as will be pointed out in the pages that follow, and it is with the frank purpose of giving projectionists helpful facts with which they may not be familiar that this paper was prepared. Needless film mutilation may be caused by defective manufacture, faulty laboratory methods, poor inspection in the exchanges, careless handling in the projection room and worn or imperfectly adjusted projection machines, and, while it is difficult in many cases to fix the exact responsibility, each possible source of damage will be fully discussed.

#### The Film

The film can be blamed only when the manufacture is defective. The base or support of motion picture film, which is of standardized thickness, is made from cotton and with reasonable care will fulfill the requirements of commercial use, but due to the nature of its origin consideration should always be given to the fact that it has physical limitations. The Eastman Kodak Company, with its years of experience in the manufacture of motion picture film, quite naturally observes every possible precaution to assure itself that the quality of its product is kept uniform. Samples from all coatings are thoroughly tested for their photographic and physical properties and must pass careful scrutiny of inspectors whose sole duty it is to find flaws or imperfections.

The matter of accurate perforating is of the utmost importance and is only accomplished by constant vigilance on the part of experts to keep the machines at the highest degree of precision. Recent changes in the perforation dimension of Eastman positive film was adopted only after exhaustive practical tests had proved its greater endurance and wearing properties.

As a final check against photographic quality and physical characteristics, test lengths are run through regular commercial projectors, under

exactly the same conditions as would be encountered in the theatres.

#### The Laboratory

Improvements in equipment and methods of manipulation in all the important laboratories have reduced the possibility of affecting the physical properties of the film during the printing, developing and finishing operations to an extent as to be almost negligible.

#### The Exchange

Investigation of the general procedure in the inspection and repair of prints indicates that a considerable proportion of the burden of print mutilation begins in the film exchanges. It is not so much that the exchange starts the damage as that it fails to stop it. Inspections are invariably too rapid to be thorough. Splicing is carelessly done with the result that the films are frequently sent to the theatres in such poor condition as to be unable to withstand ordinary projection, to say nothing of the super requirements, particularly with respect to high speed of projection and rapid rewinding, which are all too frequently the case. In rewinding, care should be taken to see that the "rewind" is properly lined up so that the film will feed from the one reel to the other without striking the edges of the reels. The use of defective reels caused untold damage in the rewinding operation. Cinching occurs



Fig. 1. The full hole splice generally recommended

when the person rewinding attempts to tighten the roll. This causes scratches on both sides of the film.

Cupping the film to detect damaged edges, perforations, or loose splices is very apt to crack or split the film, more especially on subjects which have had repeated projection on projectors using high amperage. Careful inspection and repairs in the exchanges will result in better service to the exhibitor, eliminate breaks which are the frequent cause of film damage, reduce the amount of replacements due to breakdown, and make the subjects available for constant service. Longer commercial life means increased earning capacity.

#### The Exhibitor

Good projection is entirely dependent on the skill of the projectionist and the condition of the film and the projection machine. Through constant use projection machine parts become worn and out of adjustment. Projectors should never be permitted to get in this condition. Replacement parts are readily available and for the most part inexpensive, and any expenditure in this connection will improve projection and materially help in the reduction of unnecessary film loss.

Careful study of the following will be helpful to all concerned with motion picture film.

#### Splices

Splicing, whether done in the film laboratories, film exchanges or projection rooms, has such direct bearing on the welfare of the film as to call for special and constant attention.

Much film is ruined by poor splicing. Splices that are wide, stiff, buckled and out of line cause the film to jump the sprockets resulting in torn perforations or breaks. Perforations in the vicinity of a splice of this kind will always be found to be strained or broken out. Stiff and buckled splices are caused by excessive scraping of the film, or a too liberal application of cement or both. The use of a poor quality cement results in splices pulling apart especially in the film gate or trap. This constitutes a hazard; therefore, all weak or otherwise bad splices should be remade before projection. Figure 1 shows the well-known full-hole splice which is the most widely used and if properly made gives the best all-around results.

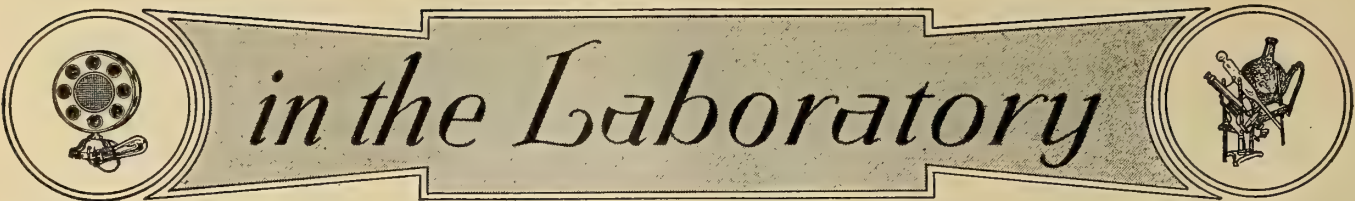
Pamphlets on splicing instructions may be had without any charge on application to the Eastman Kodak Company, Rochester, N. Y.

Whenever film is damaged on a projector, it is generally customary to lay the cause of the trouble to one or more of three different things: namely, sprockets, idlers, and tension exerted on the film by the springs in the gate or film trap.

While it is true that in most cases the trouble can be traced to one or

(Continued on page 39)





# in the Laboratory

Conducted by SAMUEL WEIN

## Light Sensitive Cell Nomenclature

A JOINT committee of representatives of Institute of Radio Engineers, Westinghouse Electric & Mfg. Co., Bell Telephone Laboratories, and General Electric Company are reported to have finished their work in connection with light sensitive cell nomenclature and have decided upon the use of the word "phototube" as expressive of the photo electric cell. This action is perfectly all right as far as it goes, but to this writer's mind, at least, the term is hardly suitable as standard nomenclature for all light sensitive cells, since it apparently refers only to that specific type of cell which gives what is known as the "Hallwachs effect," i.e., *electronic action as a result of light*.

It is commonly known that there are other types of light sensitive cells, and while they do not belong to the *electronic group* it cannot be denied that they function as a result of light falling upon them. In addition to the photo electronic group there are (1) the photo conduction family, of which selenium is a very prominent member and the sulphides and oxides of the metals, etc., and (2) the type which embodies the so-called Becquerel effect in which a chemical action is the result of illumination. This latter form is commercially known as the photo voltaic cell.

My contention is that the action of the standardization committee above referred to is hardly in keeping with a wholly desirable forward-looking outlook on progress within the art, since the use of the word "phototube" implies a limitation of work in the art to the vacuum or gas-filled types of cells.

When one recalls the splendid work accomplished in the light sensitive field by workers in other than the vacuum and gas-filled fields the shortsightedness and unfairness of the new standard becomes apparent.

While the term "light sensitive cell" covers the entire phenomena of light action on the metals and compounds—including all three types: photo electric, photo conductive, and Becquerel effects—a non-descriptive term should be applied as a *family* name with further subdivisions to be classified according to their true nature.

## A New Type Exciting Lamp

DR. J. W. MARDEN of the Westinghouse Electric Co. announces a new type of lamp, in which an abundance of ultra violet rays emanate. The lamp is intended for subjecting human beings to artificial sun, and so stimulate blood circulation below the skin, etc. The lamp has a rating of 25 watts, i.e., 20 volts at 1.25 amperes. The physical dimensions of the lamp are that of the conventional incandescent lamp.

Just why such a lamp cannot be used as an exciting lamp is the concern of the present article. It seems logical, that any source of illumination so rich in ultra violet rays, and with such a low rating, would find immediate application to sound motion pictures, particularly as an exciting lamp.

### Rich in Ultra Violet Rays

It will be remembered that the greatest flow of photo electrons are had on exposing the photo-electric cell to a rich source of ultra violet rays. Such being the case, a larger number of photo-electrons ought to flow as the result of exposing the cell to the lamp devised by Dr. Marden. A decided advantage of a greater photo-electron

flow is that less amplification would be necessary, and, accordingly, less distortion would result.

It is hoped that Dr. Marden will take our suggestions in this respect, and adapt his lamp particularly to accommodate the requirements for sound motion pictures, and thus aid development in the art.

## Use of Battery Eliminators

THE elimination of batteries, and the attendant care, is the subject of considerable experimental investigation by a number of investigators. By elimination of batteries is meant the adaptation in the circuit of a device which gives a D. C. potential without any "ripple"—in simpler terms, a rectified A. C. potential.

There is available today several types of rectifiers which can be used in the projection room: (1) the electronic tube, in which a filament and plate are used (diode tube), with a trace of an inert gas, and (2) the crystal rectifiers, i.e., the oxides or sulphides of the metal and in particular, the sulphides or oxides of copper. As might be expected, each of these rectifiers have their own particular advantages.

It is possible to design at the present time a rectifier giving extremely heavy potentials, sufficiently high to function the A, B, or C potentials of an amplifier circuit, or to operate the "exciting lamp" circuit, etc. All that is required is the proper capacity rectifier unit, and a suitable capacity and inductance in the circuit to "smooth out the ripple" of the "raw D. C." so formed by the rectifier. Proper shielding of the rectifier is another requisite.

Here is a list of manufacturers making rectifier units who are in a position to give detailed information concerning the proper number of elements, capacity of condensers, and inductance characteristics:

Forest Electric Corp.  
Newark, N. J.  
Tube types

Elkon Works,  
Indianapolis, Ind.  
Copper sulphide units

Westinghouse Elec. & Mfg. Co.  
East Pittsburgh, Penn.  
Copper sulphide units

B-L Electric Corp.  
St. Louis, Mo.  
Copper sulphide units

## Anti-Vibration Material

ALL projectors, be they stationary or portable, have a tendency to vibrate, and these vibrations are picked up by the sensitive sound amplifiers and these in turn are heard by the audience. Various methods of compensating for vibration have been resorted to, particularly the suspension of the sensitive devices by heavy springs, elastic bands or flexible plates. Other methods employ rubber or felt padding with good results.

There has been submitted to us for approval "Keldur" a synthetic rubber for anti-vibration purposes. The physical appearance of the compound is sort of a black or dark brown gelatinous mass, and is cast between two coarse woven material. This material can be had in sheets 26 inch by 36 inch by  $\frac{3}{8}$  inch thick.

We have tried this material out with good results, and it is hereby recommended to those projectionists who are experiencing difficulty as a result of vibration.



## Continuous Projection

(Continued from page 26)

on the aperture. Assuming that the screen image is in frame, the optical centers of a pair of lens wheel elements will also lie on the axis of the front element of the objective, therefore, at this instant, we have a centered system which is comparable, in all respects, to any ordinary projection objective. In this position of film and lens wheels, the light reaching the screen is supplied through the single frame centered on the axis, which we will call frame No. 1.

As the film moves downward across the aperture, and the lens wheel elements rotate downward at the required proportional rate, the screen image of this frame No. 1 remains stationary, and of full intensity until such time as the succeeding pair of lens wheel elements enters the light beam. As the radial line between lens wheel elements enters and passes through the light beam, the image of film frame No. 1 decreases in intensity, but the total screen illumination is maintained constant by the additional light coming through the adjacent film frame No. 2, which is transmitted to the screen by the incoming pair of lens wheel elements. At the instant when the radial line

between lens wheel elements crosses the principal axis, the line between frames No. 1 and No. 2 will also be on the principal axis, and each of the frames No. 1 and No. 2 is supplying equal light to the screen.

As the film continues to move downward, the first pair of lens wheel elements moves further and further out of the light beam until they finally clear it entirely, and, at this instant, No. 1 film frame ceases to supply light to the screen, and No. 2 film frame supplies all the light reaching the screen and continues to do so until another pair of lens wheel elements enters the light beam. Stated briefly, the dissolving action between film frames, which provides a smooth progressive and relatively long transition, is accomplished entirely automatically by the passage of the lens wheel elements through the light beam.

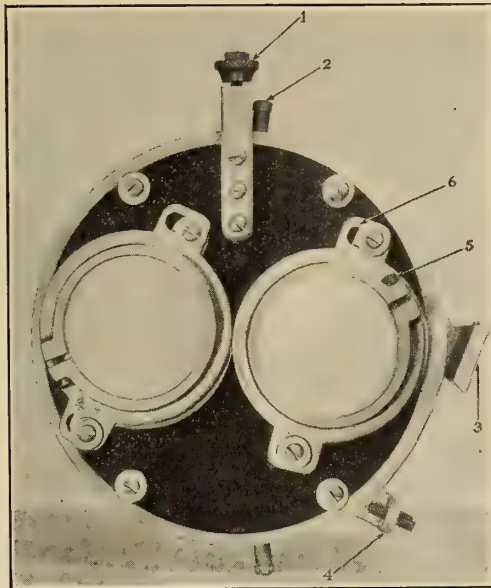
As far as the effect on the screen is concerned, this dissolving action is exactly identical to the effect obtained with a double stereopticon having a pair of iris diaphragms operated by a common control handle in a manner whereby one diaphragm closes progressively at the same rate at which the other opens. That is to say, in

the revolving lens wheel system, each film frame, starting from zero, fades in smoothly to full intensity which continues for the greater part of the picture cycle and then fades out smoothly to zero. No other system of transition can equal this in smoothness and in the accuracy with which the dissolving images are superimposed.

### Film Shrinkage Problem

The next important function to be provided for in any continuous projector is the adjustment of the optical system to compensate for variations in film shrinkage. Generally speaking, the amount of shrinkage in any given reel of film does not vary appreciably from one end to the other, hence it is seldom necessary to make readjustment during the showing of any single reel or even during a complete picture. However, it is necessary to adjust the optical system when a new subject having very little shrinkage is to be run on the program with an old one which has shrunk considerably, and this brings us to the second stiff problem the designer must solve. The exact and complete explanation of how this is accomplished in the revolving lens wheel system is rather long and involved and requires the use of several diagrams, but I will

(Continued on page 33)



TRIPLEX LENS TURRET

A door is furnished with lens turret which encloses the entire mechanism and allows ample room for the projectionist

## TRIPLEX Lens Turret

For Movietone — Vitaphone — Magnascope

Also suitable for all wide image from standard film processes.

### LEGEND:

1. Handle for revolving lenses into direct position of aperture.
2. Stop position, insuring lenses always coming into same position.
3. Block to be put in same position as present lens holder.
4. Support in turret to center frame of mechanism, insuring durability and steadiness.
5. Lens fastening screw—in a position that is easy to get at.
6. Collar on lens to adjust picture in position of screen, side to side and top and bottom, without moving pedestal. Also for centering lens for Movietone.

Sold and Manufactured by

**Capitol Motion Picture Supply Co.**

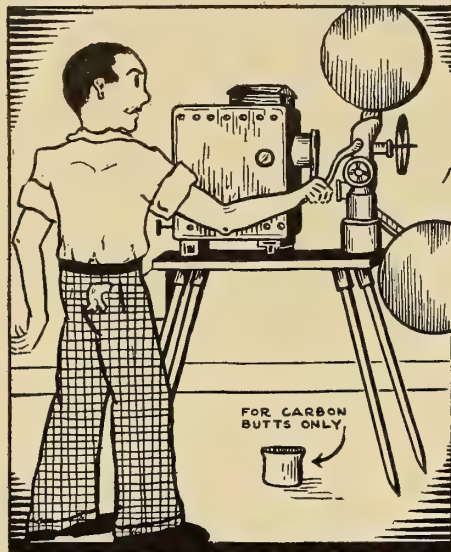
630 Ninth Ave.

(Write for Literature)

New York City



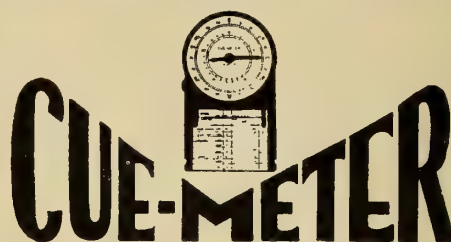
# YOU WOULD NOT



revert to the  
obsolete hand-  
crank type of  
projector THEN

## WHY SHOULD YOU

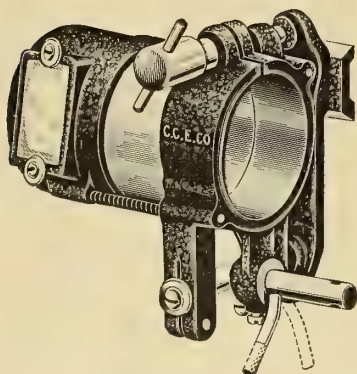
maintain the nearly obsolete  
method of cueing and change-overs. The Cue-meter  
has revolutionized the art of projection. There is no  
guesswork . . . Cue-meters are infinitely accurate.



Ask your dealer or write for further information  
**THEATRE ENGINEERING SERVICE COMPANY**  
1442 Beachwood Drive Hollywood, California

DON'T GUESS . . . USE CUE-METERS

## NORMAL IMAGES FROM SOUND-ON-FILM



**ADJUSTABLE  
LENS  
MOUNT**

Combines instant lens change, side shift for centering image, and accurate focusing adjustment in a compact, sturdy device quickly installed on a Simplex head.

Lenses may be changed, shifted and focused for either silent, sound-on-disc or sound film in less time than it takes to tell about it.

Side shift is limited by an adjustable stop screw. A simple adjustment assures repeated automatic centering merely by shifting the lever conveniently located OUTSIDE THE PROJECTOR HEAD.

Easily installed by simply removing your present lens holder and slide and inserting the new Lens Holder designed to fit perfectly. No necessity for cutting the front plate or changing doors. (Available also for Motiograph.)

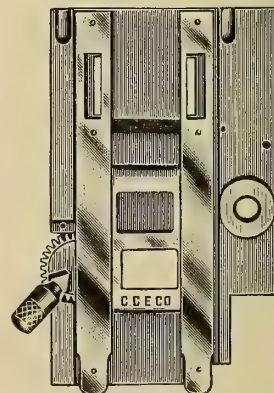
List - \$25.00

—made possible by speed-method change from silent or sound-disc films. Here is the simplest and most satisfactory system yet devised to eliminate masking, faulty centering and black flipper, by providing—

**ACCURATE FOCUS**

**PERFECT ALIGNMENT**

**CORRECT PROPORTION**



**PROPORTIONAL  
APERTURE  
GATE**

Apertures for both sound-disc and sound-on-film are mounted in an E-16 Simplex Film Trap which instantly replaces that on your machine. Slight movement of the accessible lever shifts either aperture into exact framing position.

Apertures are machined to such precise limits that projected images will be perfectly true with respect to frame, size and proportion.

Two types of proportional aperture gates are available. One is for use with your present single set of lenses, whereby you will obtain an image slightly smaller with sound film than with normal film. The other requires use of the Adjustable Lens Holder plus two sets of Lenses, and projects identical images regardless of film.

List - \$35.00

**CHICAGO CINEMA EQUIPMENT CO.** 1738-52 N. SPRINGFIELD AVE.,  
CHICAGO, ILL.

WRITE FOR BULLETINS No. 41 and 42



try to describe the underlying principle as simply as possible.

Going back to our simple lens experiment again, you will recall that the apparent displacement of the horizontal line was proportional to the displacement or decentration of the lens, the maximum bending effect for a given lens being obtained when looking through the extreme top or bottom edge. It is also true that the bending effect is proportional to the refractive power or strength of the lens. Neither of these factors, however, offers any help in the solution of the present problems because the refractive power and maximum decentration are fixed once and for all by the physical dimensions of the lens wheel elements. We must look elsewhere for adjustability in the revolving lens wheel system.

The only other factor which can produce a variation in the apparent displacement of our horizontal line, as viewed through a lens, is the distance from the lens to the line under observation. In other words, a given lens, of fixed refractive power and diameter, will cause a fixed maximum angle of deviation, but the apparent displacement resulting from this fixed maximum angle of deviation is proportional to the distance between the lens and the object under observation. It is evident, therefore, that changing the distance from the aperture plate to the revolving lens wheels, in our projector, will vary the apparent displacement. This is just what is required to accommodate variations in film shrinkage which have the effect of changing the distance between centers of film frames.

The greater the amount of film shrinkage the shorter will be the distance between film frame centers and, therefore, the closer the aperture plate must be to the revolving lens wheels. But everyone knows that changing the distance from the aperture plate to the objective is the means whereby focusing is normally accomplished, and any change here, however slight, will interfere with the definition of the screen image, hence it is apparent that the operation of adjusting for variations in film shrinkage and focusing are very intimately related in the revolving lens wheel projector. As a matter of fact they are performed simultaneously, the change in the back focus being made possible, without loss of definition, by a proportional displacement of the front element of the objective along the principal optical axis. The law governing the relation of the aperture distance and front element distance from the revolving lens wheels, is known, and, with this as a tool, it is a simple matter to design a proportional movement having single unit control, which provides simultaneous adjustment for both film shrinkage variation and focus.

If the projector is not in correct adjustment for a given film, the dissolv-

ing images will not be exactly superimposed on the screen, and there results what might very properly be termed an astigmatic loss of definition which is most pronounced on horizontal lines and not at all present on vertical lines in the picture. That is to say, horizontal lines will not be sharply defined and the definition of any given line in the picture will be better the nearer the line approaches to the vertical. We might say, therefore, that the adjustment of the optical system for varying shrinkage of film, which is accomplished by operating a single conveniently located hand-wheel, is, in reality, the operation of securing definition on

horizontal lines equal to that on the vertical lines in the picture. When the optical system has once been adjusted for any given film, the definition on vertical lines does not change, and any loss of definition on horizontal lines, due to change in amount of film shrinkage, is quickly noted by the projectionist and easily corrected.

#### Continuous Projection? What About It?

The trend of human thought is strange indeed, and very often the joy of anticipation is greater than the pleasure of realization. About everyone connected with the motion picture industry, has, at some time, thought of the advantages of continuous pro-

## Every production can have both color-tints and sound

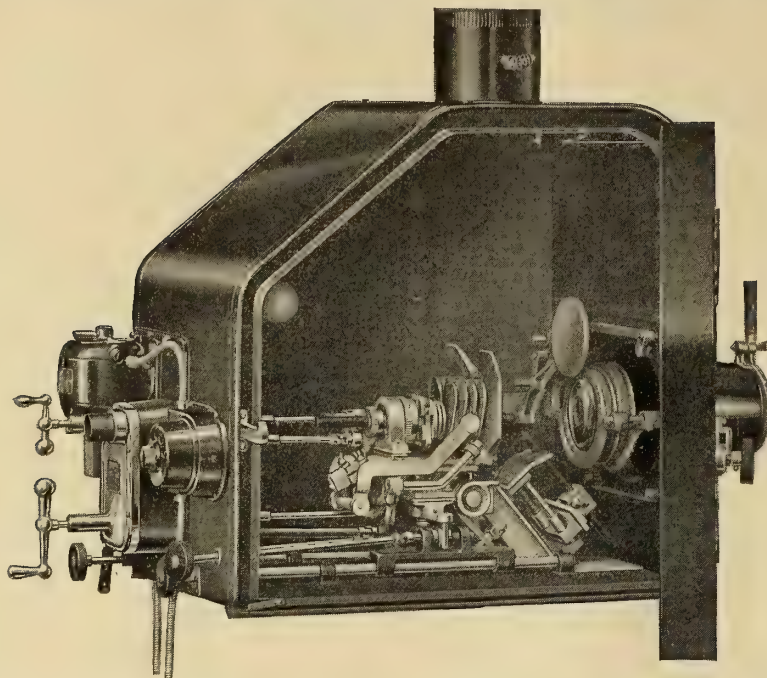
**EASTMAN Sonochrome Tinted Positive**  
**Films give charming atmospheric tints**  
**that express the mood of every scene, or**  
**the prevailing lighting of the picture.**  
**Besides, these films reproduce sound with**  
**exceptional fidelity. Through their use**  
**every production can have both color-**  
**tints and sound, for Sonochrome costs no**  
**more than ordinary black - and - white**  
**positive.**

**EASTMAN KODAK COMPANY**  
**ROCHESTER, NEW YORK**

**J. E. Brulatour, Inc., Distributors**  
**New York                      Chicago                      Hollywood**



# ASHCRAFT SUPER HIGH INTENSITY LAMP



Among some of the prominent users are the following:

*Fox Studios, Warner Bros. Studios, Metropolitan Studios, Universal Studios, M-G-M Studios, United Artists Studios, First National Studios, Fox Theatres (New York and Los Angeles) and Warner Bros. Theatres.*

Designed for theatres where an enormous increase in light is necessary for the presentation of large pictures. It is a noteworthy fact that all motion picture studios now developing wide film are using *The Ashcraft Super High Intensity Lamp*.

## THE ASHCRAFT SUPER HIGH INTENSITY PROJECTION LAMP

**ASHCRAFT AUTOMATIC ARC COMPANY**  
4214 SANTA MONICA BOULEVARD  
HOLLYWOOD, CALIFORNIA

jection; some stress the value of prolonged life of film; while others regard quietness of operation as of greatest value; all have hoped that some day continuous projection would be an accomplished fact. Now that a practical continuous projector has been developed, the question is, how is it to be introduced to the industry? The first step is naturally to make known its important characteristics and the following statements are made with that end in view.

Most of the advantages ordinarily credited to continuous projection are the direct result of continuous film movement, and although they are important, especially in connection with sound film equipment, they are in reality minor considerations compared with the advantages of continuous projection as we have defined it, namely, the showing of motion in pictures through the medium of continuous non-periodic screen illumination. If all the benefits to accrue to the industry from the adoption of continuous projection resided in the advantages of continuous film movement, *per se*, it is doubtful if the cost of re-equipping theatres would be warranted. It is strange to me that the deep-thinking men of the motion picture industry have not begun to realize the value and possibilities of the dissolving transition provided by the revolving lens wheel system, for therein reside the prime advantages of continuous projection.

Just because our great-grandfathers got along with illumination from a few tallow dips, there is no reason why the present generation should do without electric lights. . . . So, after all, what about continuous projection? Does it represent progress? What are its real advantages to humanity?

### That Certain "Quality"

In every direct comparison demonstration (and there have been many of them made in the past seven or eight years, although in the early days, our presentations were unsteady and poorly illuminated and often suffered from lack of critical definition), observers, both in favor of and opposed to the development, have never failed to notice, in spite of inherent defects, a "quality" of image unknown to intermittent projection. As the imperfections in optical and mechanical parts were slowly but steadily eliminated year after year, this "quality" became more apparent, and now, that our projection is pronounced equal to the best intermittent performance as regards steadiness, illumination and definition, this "quality" stands out as the striking difference between continuous and intermittent projection. I shall not attempt to describe this "quality," but those who have seen a demonstration of the revolving lens wheel projector, know it is *real*, and those who reason will get some understanding of what this "quality" may be from the fol-

**KEEP all your COPIES of  
MOTION PICTURE PROJECTIONIST  
AS A REFERENCE FOR CURRENT  
AND FUTURE NEEDS — PRE-  
SERVE THEM IN A  
BINDER**

**\$3<sup>00</sup>**  
**each**

GOOD SOLID  
IMITATION LEATHER  
—GET ONE

ORDER FROM THE MOTION PIC-  
TURE PROJECTIONIST



lowing analysis of conditions at the screen.

### The Flicker Phenomenon

Some of the characteristics of periodic illumination are commonly known and the examples are numerous. Here is a typical one. The other day, late in the afternoon, while riding in a car on the elevated railway structure in New York, I happened to be seated where the sun shone on my face. The sun was too bright to look at it directly, but it was not uncomfortable to look in its general direction until the train pulled into a station and the shadows of successive window frames, forming the station enclosure, blinked across my eyes, at first rapidly and then more slowly as the train came to rest. The sensation that momentarily came over me, due to the low frequency beat, was not unlike that caused by seasickness. A similar condition obtains when one walks alongside of a high picket fence when the sun is shining brightly from behind it in such a manner as to cast shadows across the eyes. These, of course, are low frequency phenomena and the effects are often very marked.

Stepping up a little in frequency, we come to the peculiarities of 25-cycle small unit incandescent lighting, and here we find some characteristics which appear in motion picture projection, although the shutter frequency in sound picture presentations is 48 cycles. If one looks directly at a small incandescent lamp filament which is operating on 25-cycle current, or at a small area illuminated by such a lamp, there is scarcely any flicker noticeable at the filament or on the small area, but one knows, from the effect of light entering the eyes from areas surrounding the spot under critical observation, that the general illumination is not steady.

This phenomenon is due to the structural nature of the retina of the eye. The relatively small central area of the retina, while possessing the greatest resolving power, is far less sensitive to periodic illumination than are the outer zones, hence, when one looks intently at one small area, the flicker sensation seems to come from somewhere else, and, the further removed the sources of illumination from the center of observation, the more pronounced the flicker sensation. While walking through the stations of the Hudson Tubes, when 25-cycle station lighting was used, I have often observed a very decided stroboscopic effect on the posters in the passageways. On looking directly at any word or small picture area, it would appear clear-cut and stationary, while similar surrounding objects, although less distinctly visible due to being imaged on the outer zones of the retina, showed the characteristic stroboscopic multiple outlines. This effect is undoubtedly

another manifestation of the flicker phenomenon.

Much has been written about motion pictures and their effects on the eyes, but nothing has come of it thus far because there was no practical way of overcoming the "intermittency," as many writers describe it. The average movie patron pays for seeing the show in two ways: first, in cash for the privilege of looking at the screen, and second, in more or less discomfort which results from eye strain and nerve fatigue, and some pay dearly in this latter respect.

But everything worthwhile costs something, and the human mechanism is wonderfully adaptable to its surroundings, so our average movie-goer, having never experienced any better motion picture presentation, is satisfied. Moreover, has he not been

assured time and again, that the movies do not tire his eyes any more than reading does? But if this is really true, why do professional film folks invariably sit well back of the center of projection rooms whenever they view pictures? Surely the best place in the whole room to see the defects and other details, is up close to the screen and not back near the projection booth. Of course, the further the position of the observer from the screen, the smaller will be the angle the screen subtends at his eyes, hence the areas of the retina most sensitive to flicker effects will be less likely to be illuminated by the screen. Perhaps the experienced screen observers have chosen the rear seats without really knowing why, but they have certainly chosen wisely, because the flicker and stroboscopic ef-



20'40 to 100/200 Ampere 2-Bearing Actodector

## EXCEPTIONAL COMMUTATION

As a result of exceptional commutation Roth Actodectors are especially suitable for use with sound equipment. This feature, combined with the ability of Roth Actodectors to maintain projection arcs of uniform intensity and unvarying brilliance—even during change-over—is responsible for their wide use by the large circuits. . . . Furnished in 2- and 4-bearing types—various sizes from 20 to 600 ampere capacity—standard voltages of 75, 85 and 100 volts.

### ROTH BROTHERS AND COMPANY

*Division of Century Electric Company*

1400 W. Adams St. » » » Chicago, Ill.

## "THEY KEEP A-RUNNING"

another manifestation of the flicker phenomenon.

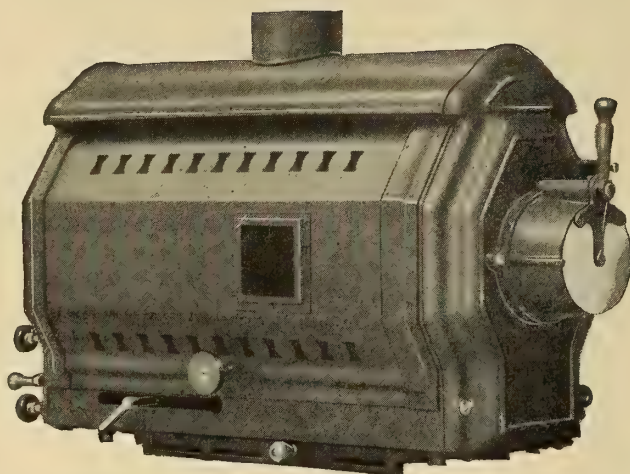
Much has been written about motion pictures and their effects on the eyes, but nothing has come of it thus far because there was no practical way of overcoming the "intermittency," as many writers describe it. The average movie patron pays for seeing the show in two ways: first, in cash for the privilege of looking at the screen, and second, in more or less discomfort which results from eye strain and nerve fatigue, and some pay dearly in this latter respect.

But everything worthwhile costs something, and the human mechanism is wonderfully adaptable to its surroundings, so our average movie-goer, having never experienced any better motion picture presentation, is satisfied. Moreover, has he not been

assured time and again, that the movies do not tire his eyes any more than reading does? But if this is really true, why do professional film folks invariably sit well back of the center of projection rooms whenever they view pictures? Surely the best place in the whole room to see the defects and other details, is up close to the screen and not back near the projection booth. Of course, the further the position of the observer from the screen, the smaller will be the angle the screen subtends at his eyes, hence the areas of the retina most sensitive to flicker effects will be less likely to be illuminated by the screen. Perhaps the experienced screen observers have chosen the rear seats without really knowing why, but they have certainly chosen wisely, because the flicker and stroboscopic ef-



# *Better Screen Results* with **BRENKERT** LOW INTENSITY REFLECTOR LAMPS



**P**ROVEN by installations throughout United States and Canada, you are assured of complete satisfaction when you specify Brenkert Lamps.

Made and guaranteed by one of the oldest and largest manufacturers of light projection equipment for the theatre and sold and serviced by progressive independent supply dealers throughout the country.

Write for literature or see your independent dealer.

**Brenkert**

**BRENKERT LIGHT PROJECTION CO.**  
ENGINEERS and MANUFACTURERS  
St. Aubin at East Grand Blvd. Detroit, Mich.

## IN WESTERN CANADA! **CANADIAN THEATRE SUPPLY CO.**

Authorized distributors for  
**SIMPLEX—MOTIOGRAPH—POWERS—HOLMES**  
and all theatre equipment of the leading manufacturers. Also, an extensive line of stage equipment.

**Complete Sound Picture Service!**

**306 Canada Building**  
Winnipeg, Man., Canada

Alberta Representative

**M. L. ADAMSON**

9921—113th St., Edmonton, Alb., Canada

fects are unquestionably more pronounced closer to the screen. If you don't believe it, just try the experiment of sitting in the front row through an entire presentation, and don't forget that, in most houses, you are still several times the screen height away from the flickering images.

Incidentally, it is interesting to speculate as to just what effects wide screen presentations will produce in connection with this phenomenon. We have already heard much about the difficulty of getting good light distribution on wide film projection. Perhaps it may not be altogether the "distribution" after all. There is one other thing to be observed in connection with the consideration of flicker effects, namely, the greater the intensity of illumination per unit area of screen surface, the more pronounced will be the flicker at a given frequency. While flicker is seldom visible in the darker areas of a scene, it invariably appears as a scintillation or glistening effect in the highlights if the screen is brightly illuminated.

### Excessive Screen Illumination

The demand for more and still more intense screen illumination is responsible for another effect which is not altogether advantageous. In the first place, the clear whites become glary and therefore hard to look at, especially when they cover most of the screen area, as in snow, water and sky scenes. In the second place, the scale of gradations, from clear whites to darkest shadows, is unbalanced by a preponderance of detail in the brighter parts of the picture and a dearth of detail in the darker portions. It is not difficult to account for this effect. The iris of the eye adjusts itself to limit the intensity of the light reaching the retina, so, if the highlights of the picture under observation are excessively bright, the iris opening is correspondingly reduced in size to cut down the average intensity of the retinal image, thus blotting out gradations in the darker areas of the picture by admitting too small an amount of light from these areas to cause them to become distinguishable one from the other. While this effect is present with continuous non-periodic illumination, there is considerable scientific data, concerning the "speed of seeing," which indicates that it is greatly accentuated by intermittent illumination, even at the relatively high frequency of 48 cycles. The general effect of excessive screen illumination is in some ways similar to the effect of glare spots, the evils of which are now quite generally recognized.

Much more can be said about intermittent screen illumination and further investigation will undoubtedly disclose other reasons why it causes eye strain and fatigue. There is no denying that the sound picture projection rate produces a more pleasing show than the old 16-picture-per-



second rate did, but the illumination is still intermittent and the eye strain effect has not been noticeably reduced. A 16-picture rate with present screen intensities gives a decidedly flickery performance. However, for conclusive proof that intermittent projection does cause eye strain, one has but to turn to the great quantities of statistical data already compiled, study the reports of physicians and other authorities, and analyze their recommendations concerning the use of motion pictures for instruction purposes in schools. In view of all this evidence, no intelligent person can deny the fact that intermittent projection causes eye strain.

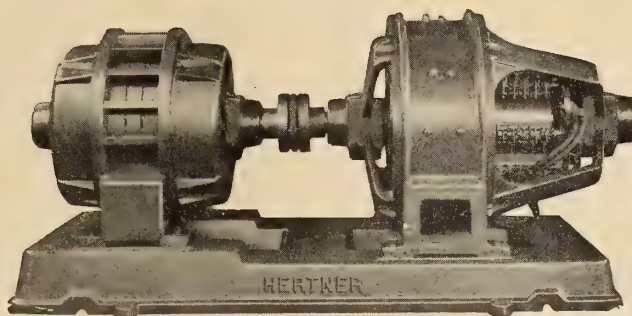
While relatively few have ever seen motion pictures presented through the medium of continuous non-periodic screen illumination, everybody understands and appreciates the qualities and characteristics of images projected with lantern slides. Did you ever hear of anyone sitting way back at a stereopticon show because the pictures hurt his eyes? Have you ever noted the pleasing qualities of lantern slide images projected as introductions to features? There is unquestionably a difference in "quality" which is quite apparent when the intermittent images come on over the slide images.

Continuous projection, by the revolving lens wheel system, provides the kind of screen illumination present in lantern slide exhibitions and consequently produces slide "quality" in the presentation of motion pictures. Thus continuous projection, possessing many advantages over the intermittent system, surely represents improvement and progress in the art of motion picture presentation. By providing a more pleasing show, it adds to the theatre patron's enjoyment, and by greatly reducing eye strain and nerve fatigue, it removes one of the most serious factors tending to reduce attendance at motion picture theatres.

The question is this; Which is preferable, a shutter cut-off transition and intermittent screen illumination with all of its well-known shortcomings, or a smooth dissolving transition without shutter effect and lantern slide "quality" of screen illumination? Equipment manufacturers are puzzled. What will be the reaction of Producers, Exhibitors and the Public to this question?

### Big Technicolor Net

Technicolor and subsidiaries for the eight months ended Aug. 31, report net profit of \$942,590 after operations, amortization and taxes. Gross profit was \$1,849,019. Current assets totaled \$1,397,396, of which cash comprised \$289,387 and accounts receivable \$570,880. Current liabilities aggregated \$589,364, accounts payable totaling \$320,861 and surplus \$1,891,217. Total resources of the company are \$7,790,071.



## The American Public Has Spent More Money this Year for Amusement Than Ever Before

If it's a contest in your locality as to *how* this amusement fund is being *divided*—there is only one ultimate answer—

**"He who serves best profits most."**  
**To serve best you *need* the TRANSVERTER.**

It is essential to good Projection. It improves projection as it reduces expense in current, in repairs, in the Projectionist's work.

Why not get the facts. Write us. Let us show you just what the TRANSVERTER and its kindred equipment will do to make your Theatre more popular in your community.



Canadian  
Distributors  
Perkins  
Electric  
Ltd.

**THE HERTNER ELECTRIC COMPANY**  
**Transverter**

12688 Elmwood Avenue

Cleveland, Ohio, U. S. A.

### Schenck on Color, Wide Film

Warning against a repetition of the industry's experience with color, Joseph M. Schenck said that this element in picture-making has lost popularity not through its constant use, but through abuse. Producers, in a hurry to get color product on the market, put out prints inadequately made, he asserted. The results were the same as if they had produced bad pictures as theatergoers formed a distaste for them.

Color must be used discriminately, said Schenck. Costumes and backgrounds must be selected with great care, as in the case of "Whoopie," he declared. He believes that the in-

dustry needs a three color process in order to produce the best results.

### Television 5 Years Away

Television, if it ever arrives on a commercial level, is at least five years away, said Schenck. He stated he has personally examined two processes in which interests were offered him.

In addition to "The Bat Whispers" wide film will be used in some sequences in Douglas Fairbank's "Reaching for the Moon," the United Artists chieftain said. The company's wide film process involves making the scenes on 65 millimeter film, and reducing it to 35 millimeter in printing. A projector attachment permits enlarging of the image when screened.



# Health



## PROTECTION FOR YOUR COMMUNITY

Tuberculosis is the enemy of all. Your safety from it lies in the health of everyone else. Education, nursing service, medical advice and children's fresh-air camps are provided by the funds from the sale of Christmas Seals—the little seal of good-will to men. Every dollar you invest in Christmas Seals is devoted to effective health protection.

The National,  
State  
and Local  
Tuberculosis  
Associations  
of the  
United States

## FIGHT TUBERCULOSIS WITH CHRISTMAS SEALS



*This space donated by MOTION PICTURE PROJECTIONIST*

**Give This to Your Friend—Have Him Fill It in and Mail to us at Once**

The Motion Picture Projectionist  
45 West 45th Street, New York City

Gentlemen:

Enclosed please find \$2.00 for which enter my subscription for one year (12 issues) starting with .....issue. (Two years, \$3.00.)

Name .....

Street .....City .....

State .....Local No. ....

## Inventive Trend Shown in Annual Patent Report

Inventors throughout the country stimulated by the wave of prosperity which was still showing great vigor in the first part of the last fiscal year, established a record for all time in their dealings with the Patent Office during the twelve months which ended June 30. While the industrial decline was clearly apparent during the greater part of that period, Patent Office figures made public showed that the creative effort previously encouraged on such a large scale had continued in numerous cases to fruition. Many of the patents represented developments in the mechanical and chemical fields, which have come to be the fairways of modern life.

During the last fiscal year, his preliminary statement showed, the applications for mechanical patents totaled 91,430 as compared with 87,039 in the preceding year. The 49,599 patents issued exceeded the total of the preceding fiscal year by 5,982.

### The "10-Cent Store"

The Patent Office "10 cent store" also did a phenomenal business, since the number of printed copies disposed of during the year increased from 6,405,000 to 7,453,000, or 17 per cent. In fact, the number of printed copies disposed of increased from 5,595,000 two years ago is 7,153,000 last year. This means that each day the Patent Office disposed of 5,000 copies more than it did two years ago.

The number of photostats made by the Patent Office increased during the year from 713,000 to 978,000, or 37 per cent, bringing a profit of over \$40,000.

The total receipts for the year were over \$4,000,000 or \$300,000 greater than the previous "peak" year, 1929.

### Weston Test Set

The Weston model 547 test set manufactured by the Weston Electrical Instrument Corp., Newark, N. J., is designed to meet service requirements as found in the projection room and studio.

It will measure the various AC and DC voltages used for the audio amplifiers either at the socket or at any part of the set while in operation.

### Has Many Adaptations

It will test continuity of circuits and test tubes including the AC or DC screen grid (type '24 and '22), also the '50, '45, and '10 type power tubes under the same conditions as exist when in their sockets. All these tests, it is said, can be made by using the regular voltages normally supplied to the set by its batteries or rectifier power units, with no change in connections, so that no auxiliary power supply is required.

The AC voltmeter is provided with ranges up to 750 volts, which may be used to measure the voltage of the plate supply transformer.



## Film Mutilation

(Continued from page 29)

more of these points, it must be admitted that the direct cause of a great amount of film damage is never definitely settled between the film exchanges and the projectionists, especially when the projectors in question have been gone over quite carefully and everything has been found to be in apparently good condition.

In cases of this kind, it is only natural to assume that the film stock is at fault. There are, however, various projector parts, generally considered more or less unimportant which, as a rule, receive little or no attention on the part of the projectionists. The result is that the film trouble is apt to start at any one of them.

The following résumé covers the more important points which must be given careful attention by the projectionist, if the maximum wearing qualities are to be obtained from the film.

### Tension on Springs in Gate or Trap

One of the principal sources of trouble is the use of excessive tension exerted on the film by the springs in the gate or trap. A great variation will be found in tension on various projection machines being used in the trade. Moreover, there are some projectionists who are not

familiar with the amount of tension which should be used, and as far as we know, there is no set standard which is generally accepted as being correct.

It is common practice to set the springs just tight enough to hold the film stationary at the speed which is used in a given theatre. Excessive tension as high as 34 ounces has been

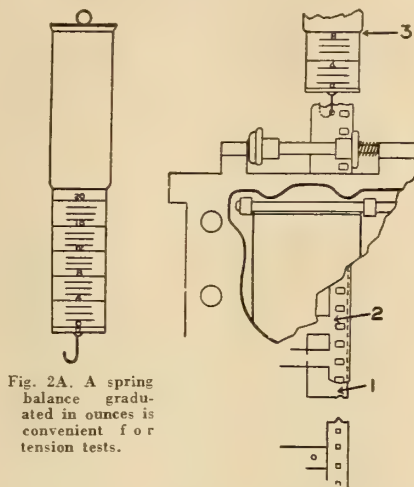


Fig. 2A. A spring balance graduated in ounces is convenient for tension tests.

Fig. 2B. Tension tests are made on each side. 1 is the film, 2 the pressure plate and 3 is the spring balance at 8 ounces.

found to exist on certain projection machines and causes badly nicked and pulled out perforations. Heavy tensions on one side can be caused by a poorly adjusted, weak or broken spring and results in an uneven pull-down strain on the film. On projectors using the gate a stop or catch is provided which holds the gate in the same position each time it is closed.

Projectors using a trap door or pressure plate are not provided with a stop of any kind, thereby allowing varying amounts of tension to be applied to the film. The trap door or plate should never be let back against the film with great force as this results in exceptionally heavy tension, which must be withstood by the film until the door or plate has worked back to its proper position. The proper tension exerted by the springs should be 8 ounces for each spring or 16 ounces combined tension. Below Figure 2 is given the proper method of making a tension test.

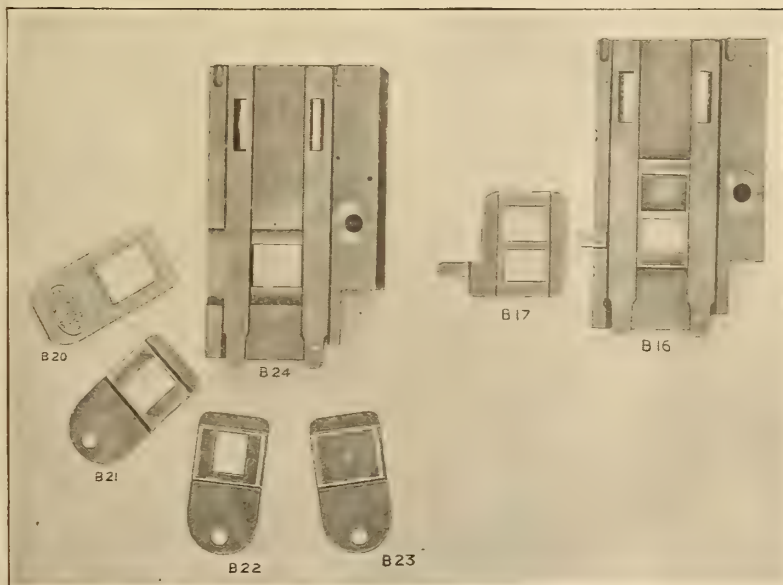
Referring to illustration B: first the tension on one side and then on the other is taken by using one-half of a strip or film about 8" long. This strip is prepared by slitting a piece of film down through the center. Care should be taken to observe that the perforations on this strip of film are free of the teeth of the intermittent sprocket and are held properly in place by the tension shoe before pro-

(Continued on page 44)

## BLUE SEAL HEAT RESISTING IMPROVED FILM TRAPS FOR SIMPLEX PROJECTORS

MADE OF AN IRON ALLOY

Guaranteed not to Warp under the intense heat of the Arc Spot. A necessity for the Perfect Projection of "Sound" Pictures



- B-16 Film Traps with Sliding Double Round Corner Apertures, one Aperture for Disc and Silent Film and one cut Proportional for Movietone Film to be used with our Adaptors.... \$30.00
- B-17 Sliding Double Aperture Plate ..... 6.00
- B-24 Film Trap with individual mats for silent, movietone and magnascope effect. Traps complete with all mats..... 30.00
- B-20 Master Plate to hold mats stationary ..... 1.50
- B-21 Standard Aperture with Square Corners..... 1.50
- B-22 Proportional Movietone Aperture with Square Corners..... 1.50
- B-23 Blank Mat (CAN BE CUT ANY SIZE APERTURE).... 1.50

Manufactured by

# BLUE SEAL PRODUCTS CO., Inc.

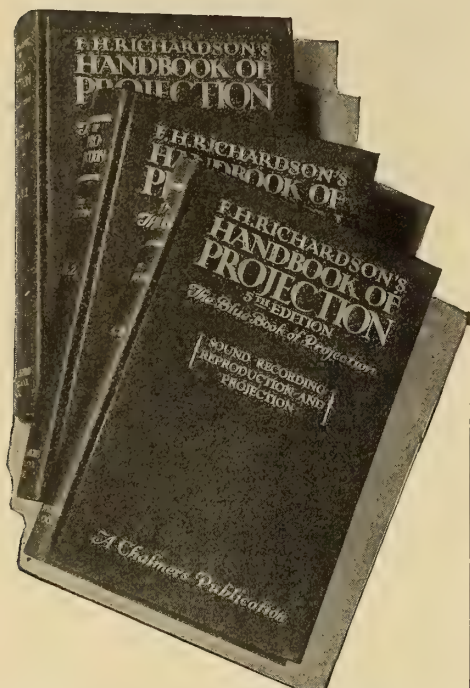
262 Wyckoff St.

Brooklyn, N. Y.

Manufacturers of Motion Picture Accessories Since 1913



# Indispensable



That's why F. H. Richardson's **HANDBOOK OF PROJECTION** Has Been the Standard for 20 Years

Over 1400 pages of subject matter; more than 400 illustrations. Think what it means to own this finest of projection libraries—something that will be useful throughout the year.

Volumes I and II cover the subject of silent projection. Volume III is devoted entirely to sound projection.

Each volume contains Richardson's complete question and answer index.

Volumes I and II \$6.20 postpaid

Volume III alone \$5.10 postpaid

The complete set \$10.25 postpaid  
(Immediate Delivery)

BOOK DIVISION

**CHALMERS PUBLISHING CO.**

516 Fifth Ave., New York, N. Y.

WINNIPEG, CANADA

**J. M. RICE & CO., J. M. Rice, Prop.** Leading equipment dealers in all kinds of projection room equipment facilities. Representatives of leading equipment manufacturers of the United States and Canada. All our merchandise guaranteed for performance and stability. Whatever you want, we will supply it.

## Practical Hints on Storage Batteries

By S. C. Aikenhead\*

Willard Storage Battery Company

**S**TORAGE batteries reduce to a minimum noise due to variations in the current through the filaments of the exciting lamp and the tubes in the first four stages of amplification. The proper design, manufacture and performance of the batteries is therefore very important to good quality sound reproduction.

Batteries must be in good condition, freshly charged, and of ample capacity; batteries cannot be used to anywhere near the point of complete discharge on account of the voltage drop that occurs, which drop renders it impossible to obtain the proper current values.

Failure of batteries during a program may be guarded against by the periodic use of a suitable low reading voltmeter, carefully observing the voltage of each battery *when the apparatus is drawing its normal operating current.* Where the voltage of a fully charged battery shows indication of abnormal and rapid drop, when put on load, to a point below 5.8 volts, an internal inspection should be made. Voltage measurements made on a battery when it is NOT delivering full operating current do not give a reliable indication as to its fitness for further use.

### Causes of Noisy Operation

Several conditions may exist in a storage battery causing noisy operation of the system. Careful attention

\* Notes from a lecture delivered by Mr. Aikenhead before the Cleveland Chapter, A. P. S.

must be paid to the following points:

(1) A battery continues to evolve bubbles of gas for sometime after it is taken off charge, and while it is doing this it will cause noisy operation.

(2) Corroded and dirty terminals make it hard to secure good electrical connections. Clean the terminals and scrape the contact surfaces bright with a knife or wire brush, coat the contact surfaces with pure vaseline or non-oxide grease, tighten the clamping nuts and wipe off any surplus grease.

(3) Battery tops on which acid has been spilled, or dust or dirt has collected, are a likely source of noise. Take particular care to clean under the connecting bars, as ALL parts of the insulating surface on the top of the battery must be clean.

Sulphuric acid is very corrosive in its action and will ruin clothing or other fabric. It should be neutralized immediately when spilled with household ammonia, a bottle of which should be available at all times. Use pure distilled or other approved water only for filling batteries and this water must not be stored in metallic containers. Ordinary water or water stored in metallic containers contains impurities harmful to batteries.

Never add acid under any circumstances. The acid in a battery is not "used up" by the chemical reaction and never needs replenishment unless it is upset and spilled in which case very careful attention is required by a competent battery man.

### Careful Checking Necessary

The most reliable means of checking the condition of charge of a storage battery in daily practice is that of measuring the specific gravity of the electrolyte. The specific gravity of pure sulphuric acid is about 1.835. Enough water is added to this to bring the specific gravity down to that required for the particular service on which the battery is to be used—in sound work about 1.285 or 1.300. When fully charged all the acid has been forced out of the plates into the electrolyte and the gravity should read on the hydrometer 1.285 or 1.300 or whatever is normal for that particular battery.

Two different types of storage bat-

## THE BIOSCOPE

The Leading Journal of the British  
Cinematograph Industry

20th Year of Weekly Publication

Contains a complete section each week  
for the special benefit of Projectionists.

Cash prizes awarded for original ideas  
published. Specimen copies 18 cents.

Annual Subscription 7 dollars 50

THE BIOSCOPE PUBLISHING CO., Ltd.  
8-10 Charing Cross Road, London, W. C. Eng.

## GRIFFIN FILM CEMENT

Makes a non-buckling  
patch that stays stuck

Specially Suited for Sound Prints

Manufactured by

**F. B. GRIFFIN, - - - Oshkosh, Wis.**

FREE SAMPLE and PRICES on request



teries are in general use on sound equipments, the low gravity type and the high gravity type. The charging of the low gravity type is taken care of by the operator. The high gravity type is floated across a generator to remove ripples from the generator voltage and requires special care.

It is not necessary to take specific gravity or voltage readings of all cells in your battery equipment each day. Read one cell in each bank daily as an indication of the state of charge of the entire battery. Once every three months select a new pilot cell. When selecting a new pilot cell charge the battery until the cell shows no further increase in specific gravity or voltage for a period of one hour and use this value as the "Fully charged" indications for all future readings taken on that cell. Test all cells every 60 or 90 days.

#### Points to Remember

Periodically give the batteries an equalizing charge by continuing the charge at a lower rate until the cells gas freely and until the readings show no further increase over a period of one hour.

The following rules should be borne in mind:

- (1) Always charge at the lowest rate possible consistent with the time available for charging.
- (2) The charging rate can be comparatively high when the battery is in a discharged condition.
- (3) The charging rate should be low when the battery is almost fully charged.
- (4) Never allow storage batteries to get hot. The nearer the battery is to being fully charged the more heat is generated by a given charging current.

### 22 Television Stations Now Operating in U. S.

THE Federal Radio Commission reports that 22 Television stations are now being operated in the United States by 18 companies.

In licensing applicants for frequency assignments for television transmission the Commission insists that they must produce evidence that their work is legitimate research. The main purpose of the regulation is to encourage and foster technical progress in television in order that the public may be better served. Because of the scarcity of available channels, the Commission has been forced to deny a large number of requests for television stations from applicants who were not interested in television from an experimental standpoint but merely from its commercial aspects.

#### Many Problems Unsolved

Efforts are being made to hasten the arrival of television, but tech-

nical as well as economic obstacles still must be surmounted, according to Dr. C. B. Jolliffe, chief engineer of the Federal Radio Commission, who states that within the laboratory and on the five experimental visual broadcasting channels now being used, technicians are doubling their efforts to speed the day when television will be practical.

On the television channels set aside for experiments, Dr. Jolliffe pointed out, there are twenty-four licensed stations as well as seven under construction. These transmit images which may be picked up by visual broadcast receiving sets, he said, explaining, however, that at present television has little sustained entertainment value.

#### Urge Standards Adoption

Dr. Jolliffe urged the adoption of standard scanning systems by experimental television stations, as a means of expediting development. "The Commission, while it does not require the use of standards in television, feels that the adoption of a standard scanning system by as many as possible of the companies engaged in the experimentation will increase the value of the experiments," he asserted.

Standards might be adopted such as those of the Radio Manufacturers Association, which provide for scanning from left to right and from top to bottom, with pictures of 48 lines, and with 15 pictures per second, he pointed out.

One of the major television problems, declared Dr. Jolliffe, is that of maintaining synchronous operation between sending and receiving apparatus. Unless the receiving apparatus is calibrated at precisely the same speed as that of the emitted impulses, the pictures received are off-tangent, he said.

#### New Technicolor Lens

Technicolor cameras are now being equipped with a newly developed lens which widens the field of sharp focus and brings into backgrounds definition heretofore impossible in color pictures, it is announced by Dr. Herbert T. Kalmus, president of Technicolor. The improved color work in recent Technicolor pictures is the result of this new lens, which is the outcome of 16 years of experiment, says Dr. Kalmus.



#### Theatre Equipment NEW AND USED

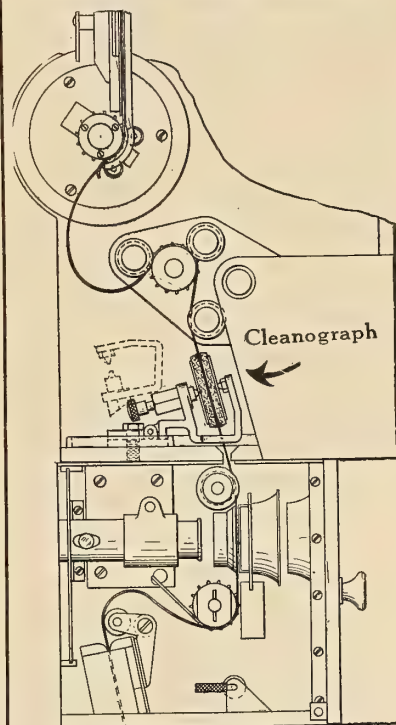
Most complete stock in the U. S. Moving Picture Machines, Screens, Booths, Opera Chairs, Spotlights, Stereopticons, Film Cabinets, Portable Projectors, M. P. Cameras, Generator Sets, Reflecting Arc Lamps, Carbons, Tickets, Mazda Lamps and Supplies.

Projection Machines repaired and overhauled. Repair parts for all makes opera chairs. Attractive 3 x 10 ft. muslin banners, \$1.50; on paper, 50 cents.

We Pay Highest Prices for Used Projection Machines, Opera Chairs, etc. Everything for the Theatre—Write for Catalog K. Movie Supply Co., 844 Wabash Ave., Chicago

## Cleanograph

Automatic  
Sound Track Cleaner



A Clean Sound Track Means  
Clear and Better Sound

A REAL HONEST IMPROVEMENT  
IN SOUND PROJECTION

In Use at Present

Roxy Theatre  
New York City

Paramount Theatre  
New York City

TESTED AND APPROVED  
BY THE LARGEST  
MANUFACTURERS OF  
SOUND EQUIPMENT

Invented and Manufactured by  
Projectionists

SIMPLE IN  
OPERATION

GREAT  
IN  
PERFORMANCE

Brothers—Write for Proposition

ADVANCE LABORATORIES

130 MALLING DRIVE

ROCHESTER NEW YORK



## Good Projection Requires Good Rectification



M. P. 25-25

## Good Rectification Means FOREST RECTIFIERS

**T**HIS Forest Rectifier meets the demand for a single unit to supply direct current for two projectors, and will furnish 15 to 25 amperes to either projector continuously.

It supplies a steady direct current, free from pulsations, and will produce a better light than other current supply devices. The only wearing parts are the bulbs which will last at least one thousand hours and usually much longer since only two bulbs are being used at a time (except during change over) and the load is alternately carried first by one set of two tubes then the other two as the projectors are alternately used.

This Forest Rectifier embodies the use of four rectifier tubes which are connected to supply current to two direct current circuits independent of each other thus preventing loss of current at the first arc when the second arc is struck.

Both arcs can be operated at the same time during the change over period and there will be no diminishing of the light from one projector while lighting up the second.

Two Ammeters are mounted on the unit which will show at a glance the amperage being used at either arc.

Links are provided for operating from 110-220 or 240 volts.

Rectifiers for all purposes made in 15 amp., 25-25 amps., 30, and 65 amps. sizes.

*We are specialists in our field. Send us your technical problems. Literature on request.*

**FOREST ELECTRIC CORP.**

New and Wilsey Sts.

Newark

N. J.

## Statistics on Theatre Fires

**T**HE observation of Fire Prevention Week during the early part of October of this year brought to light some interesting, and, in some cases, astounding facts relative to theatre fires.

In the records of the National Fire Protection Association there are listed 530 such fires, caused from a wide variety of causes. As was brought out in the discussion of the National Electric Code by Jac R. Manheimer in the October issue of *MOTION PICTURE PROJECTIONIST*, the fire hazard in theatres has been increased with the installation of talking equipment and it is therefore imperative that a new code be devised and extra precautions taken by each individual theatre manager to keep careful watch, reducing the hazard as much as is within his power.

In the opinion of experts, 75 per cent of the recent theatre fires were preventable had proper precautions been taken in advance.

### The Projectionist's Role

It is but natural that the larger percentage of theatre fires start in the projection room and it is a remarkable tribute to the efficiency and cool-headedness to the Projectionists that the vast majority of such fires are confined to where they started. Projectionists on numberless occasions have proved themselves real heroes and the same may be said of ushers and other theatre employees who in many instances have prevented loss of life and damage to property by quick, cool, decisive action when theatre fires have broken out.

It is good that such things have happened. The example of such action on the part of these men might

well be an example for others and undoubtedly will be the means of instilling the same courage into others.

It rests with the manager of the theatre to see to it that his staff is properly trained in the matter of fire drills and it is up to himself to closely inspect, at least once a week, exits, fire extinguishers, hose, accumulation of waste paper and litter, lighting, sprinklers, bits of film in projection room, and each and every possible fire hazard that may or may not exist in his house.

The following is a summary of all theatre fires as shown by the records of the National Fire Prevention Association. Projection room fires head the list with more than half the total number of fires, although officials admit that only the vigilance of projectionists prevent two or three times that number yearly.

### Projection Room Fires

Film caught fire during operation of projection machine ...	122
Film ignited from heat of machine or overexposure to arc light .....	47
Film broke in machine .....	33
Film ignited from contact with or sparks from carbons of arc light .....	20
Short Circuit in electric wiring ..	13
Film ignited by cigarette or match .....	10
Miscellaneous causes .....	39

Total Projection Booth Fires. 284

### Other Special Hazard Fires

Short circuit in talking equipment ignited screen .....	4
Film in storeroom ignited from hot steam pipe .....	1

THE  
**R O S S**

F: 2-4 PROJECTION LENS

SOLE DISTRIBUTORS:—

IN U. S. A.

**THE NATIONAL THEATRE SUPPLY CO.**

(Branches in All Large Cities)

IN CANADA:

**INSTRUMENTS, Ltd.**

OTTAWA



TORONTO



Burning incense in contact with scenery .....	1
Total Other Special Hazard Fires .....	6
<b>Common Hazard Fires</b>	
Smoking—matches .....	50
Electrical causes (except small devices) .....	27
Stoves, furnaces, boilers and their pipes .....	11
Rubbish and litter .....	7
Spontaneous ignition .....	8
Ignition of combustible material by heating or lighting equipment .....	2
Oil burners .....	7
Sparks from furnaces or stoves .....	2
Chimneys or flues—defective or overheated .....	8
Flammable liquids—ignition of .....	0
Gas ignited .....	2
Electric irons or small devices .....	0
Lightning .....	2
Miscellaneous known causes .....	5
Exposure .....	9
Incendiary .....	22
Total Common Hazard Fires .....	162
Unknown Causes .....	78
Total Fires .....	530

### Forest Rectifiers

The Forest Electric Co., of Newark, N. J., is now marketing a rectifier which will supply a direct current free from pulsations. The only wearing parts are the bulbs, which will last at least 1,000 hours and usually much longer, since two bulbs are being used at a time (except during change-over) and the load is alternately carried first by one set of two tubes then the other two as the projectors are alternately used.

This rectifier embodies the use of four rectifier tubes, which are connected to two direct current circuits independent of each other, thus preventing loss of current at the first arc when the second arc is struck. Both arcs can be operated at the same time during the changeover period and there will be no diminishing of light from one projector while lighting up the second. A single unit will supply current for two projectors and will furnish 15 to 25 amperes to either projector continuously.

### Order Better Projection Rooms

Word comes from Milwaukee that the Wisconsin State Industrial Commission has held a hearing in that city relative to proper projection room ventilation. As a result the Commission has ordered changes in the ventilation of projection rooms in practically every theatre in the state, despite protests from theatre managers. While the changes involved do not run into any considerable cost, objection was made to the order by many theatre owners.



## CINEPHOR » » LENSES « «



Made by  
**AMERICA'S LEADING  
OPTICAL  
INSTITUTION**

STARTING in Bausch & Lomb's own optical glass plant, the largest in America, every operation in the manufacture of Cinephor Lenses is controlled by experts working to the most exacting standards of precision.

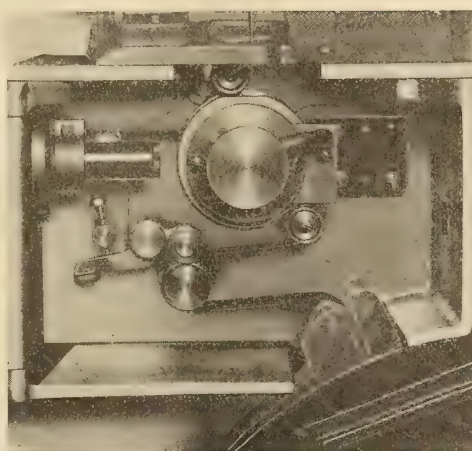
As a result Cinephor Projection Lenses give remarkable flatness of field, maximum contrast between black and white, brilliant illumination and critical definition.

Write for complete literature  
**BAUSCH & LOMB OPTICAL CO.**  
680 St. Paul Street      Rochester, N. Y.



# BAUSCH & LOMB

## SYNCR OFILM



Sound Head for Simplex

Built on the  
Reputation of  
Twelve Hundred  
**SYNCRDISK**

Installations

▼  
**ACCURACY  
QUALITY  
SIMPLICITY**  
▼

Built as accurately as the finest watch. Highest grade materials.  
All working parts chromium plated. Simple to install and operate.

### WEBER MACHINE CORP.

59 RUTTER ST.

ROCHESTER, NEW YORK

Export Department  
15 Laight St., N. Y. C.

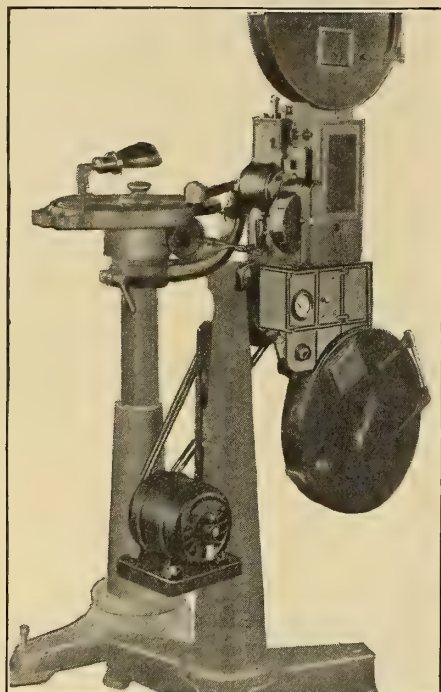
Cable Address  
"ARLAB" New York



# MELLAPHONE EQUIPMENT

*Offers Full Patent Protection to Exhibitors*

## UNDER FULL TONE REPRODUCTION COMPANY PATENTS



### Mellaphone Sound on Film

Advanced mechanically, and embodying the latest units of best known manufacturers in the sound field. Finest Photo Electric Cells. All aluminum filmheads, uses no chains. Latest Samson Head Amplifiers.  $\frac{1}{4}$  H. P. motors. Finest Optical System attainable. Gleason gears.

### Mellaphone Turn Tables

Steady and vibrationless operation, balanced flywheels, Gleason gears, ball bearing throughout. Resynchronizer. Spring Suspended Filter. Audak or Electrical Research Lab. Pick-ups. Leveling pedestal screws. Guard, lamps, and needle cups.

*Write or wire for full information. Territory for dealers.*

**MELLAPHONE CORPORATION** Rochester New York



## SUPER-LITE LENSES

WISELY CHOSEN BY  
AMERICA'S BEST THEATRES  
NEW BIFOCAL SUPER-LITE  
LENS F:2.0

A variable focus lens with a wide range of foci for both silent and sound film.

SERIES III. SUPER-LITE  
LENS F:2.0

Standard full Half-Size lens furnished in short focus as low as 4" E. F. and up to 10" E. F.

SERIES IV. SUPER-LITE  
LENS F:2.0

Full 3" diameter lens to meet the demand for more light for longer throws. 6" E. F. to 10" E. F.

*Quality Guaranteed*

**PROJECTION OPTICS CO., INC.**

330 Lyell Avenue  
ROCHESTER, N. Y. U. S. A.

## Film Mutilation

*(Continued from page 39)*

ceeding further. After fastening the end of the strip of film to the balance a straight even upward pull is made until the 8 ounce mark is reached. At this point the film will start to pull from the gate if the spring is set properly.

The combined tension of both sides is then checked as shown in Figure 3, using a full width piece of film placed in the gate so that both sides of the shoe hold it firmly against the aperture plate. After making sure that the perforations on this strip of film are not engaged by the sprocket teeth, proceed as before with a straight upward pull until the 16-ounce mark is reached. At this point if both springs are adjusted correctly the film can be

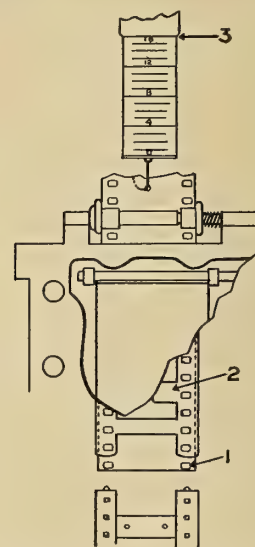


Fig. 3. A tension test is then made on both sides. 1 is the film; 2 the pressure plate and 3 the balance at 16 ounces.

pulled from the gate. To make this test correctly, the projector should be cold, using film of the average thickness.

The tension spring on some projectors can be regulated by means of small set screws while on others no adjusting device has been provided and springs must be bent by hand, but in doing this great care must be taken to get the proper adjustment.

### Sprockets

Through carelessness and neglect sprockets are frequently left on projectors until the teeth develop bad hooks and knife-like edges. Film damage caused by undercut teeth is unmistakable in appearance and in many cases film is practically ruined after one or two showings if run on a projector equipped with such sprockets. (Figure 4.)

The changing of an intermittent sprocket must be done with great care as the shaft can be bent very easily. Equipped with the proper tools any



competent projectionist can make the change but in many cases it may be advisable to have the work done at the factory to insure the best results. Before placing new sprockets on projection machines, a careful examination should be made of the teeth to be sure that none of them have been damaged by coming in contact with one another or some other hard sur-

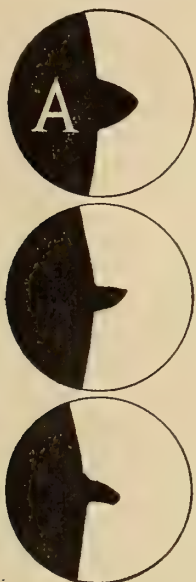


Fig. 4. Sprockets taken from projectors actually in daily use. Sprocket A is a new sprocket.

face. If a sprocket is accidentally dropped on the floor the teeth are likely to be burred or bent and if used on a projection machine, will cause untold damage to film. This will be true even if only one tooth has been damaged.

#### Adhesion of Emulsion

All new film should be waxed to insure against adhesion or sticking in the gate or trap of the projector. When unwaxed film is run, it is necessary to clean the shoes frequently, otherwise the accumulation of hardened emulsion on the shoes acts as a hold-back causing a greatly increased pull-down strain which always results in mutilated perforations. Needless to say, a new print can be completely ruined in this manner at one showing.

In removing the hardened emulsion deposits from the film tracks and tension shoes use no steel or iron implement such as screw driver, safety razor blade or file. Instead use a dampened cloth and if necessary a coin, as this will not scratch the highly polished surface.

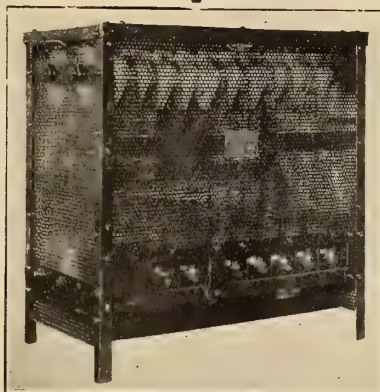
#### Guide Rollers

The guide rollers located above the gate or film-trap are there for the purpose of properly guiding the film down past the aperture to the intermittent sprocket. If these rollers are out of line with the sprocket, the teeth will naturally strike the film perforations off-center.

(To be Continued)

# Hoffmann-Soons

## PERFECTION



Three recent installations of Perfection Rheostats pile up the growing proof of leadership—

In Paramount Theatre, Paris, France.  
In State Lake Theatre, Chicago.  
In Warner's Theatre, San Pedro, Cal.  
(To say nothing of the in-betweens.)

Such coast-to-coast evidence—across the Atlantic—and on to the Pacific—has an old and new world meaning for crowded-theatre-seeking executives.

Sold by all branches of the National Theatre Supply Co., Sam Kaplan, New York, Continental Theatre Accessories, and by your dealer.

## HOFFMANN-SOONS

Electrical and Engineering Corporation  
387 First Avenue Mfg. Division New York  
Contracting Electrical Engineers—Moving Picture  
Theatre Electrical Specialists

# RHEOSTATS

## Your Preference, Please!

THE editors of THE MOTION PICTURE PROJECTIONIST solicit your aid to the end that this publication may be of the maximum service to you. Every subscriber can do his bit to improve this service by using the space provided below to indicate his preference for special articles and other material in which he may be particularly interested.

Let us know your preference, please. All requests will receive attention in the order of their receipt, so act quickly. Use the blank below to tell us in just what subject you are particularly interested. Do it now!

Editor,

M. P. PROJECTIONIST:

I am interested in the following subjects, on which I should like to see information in THE MOTION PICTURE PROJECTIONIST:

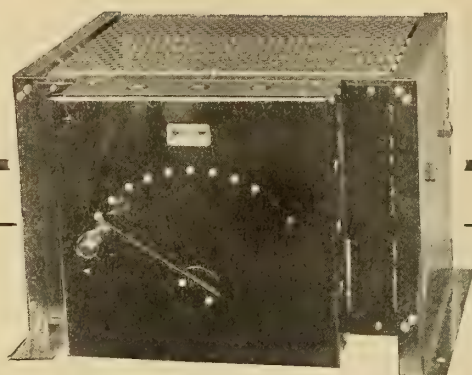
1. ....
2. ....
3. ....
4. ....

NAME .....

ADDRESS .....



## The Rheostat That Never Failed—



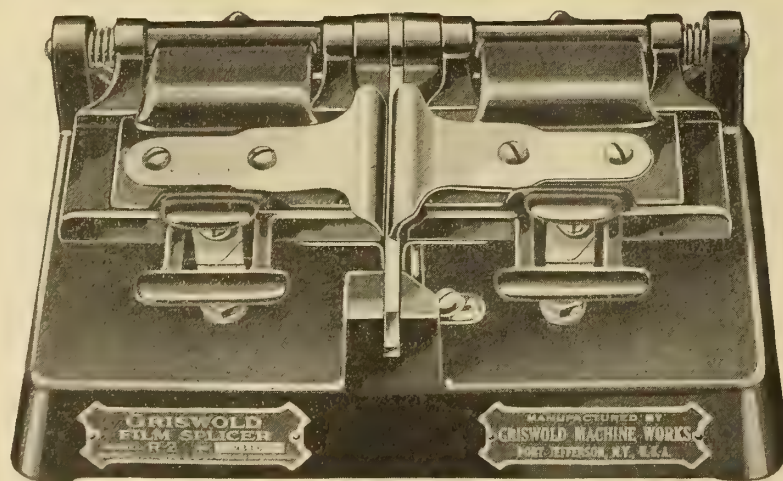
Type "G" Rheostat

**T**HERE is a growing feeling in the motion picture industry—that any trifling economy thought to be obtained by using anything but the highest quality equipment sinks into insignificance when compared with the satisfaction obtained with the best.

Publix Chicago, R.K.O. Palace, and many other large theatres of the Middle-west are finding *absolute reliability* in Schaefer projector rheostats. Manufactured of the best materials available, sturdily built, and designed with a background of 31 years' experience in rheostat work, they are meeting every requirement of projectionists.

*Write for information today*

**SCHAEFER BROS. CO.**  
1059 West Eleventh Street CHICAGO, ILL.



15,000 Griswold Film Splicers are in constant use daily in theatres throughout the World. The standard film splicer for efficiency, durability and economy.

**GRISWOLD MACHINE WORKS**

Port Jefferson, L. I.

New York

## A Few Pertinent Facts About Exciting Lamps

By V. J. ROPER\*

The frequency of exciter lamp replacement demands an explanation of the difference between it and other Mazda lamps which your experience has shown to have much greater life. In most lighting applications, higher illumination values may be obtained practically at will by increasing the wattage of the lamps used, or increasing the number of lighting units employed. However, the problem of sending light through the sound track of the film and into the photo-electric cell is unique in that only one light source may be used. And but a small portion of the total amount of light omitted by that source can be collected and redirected through the narrow slit, the various lenses, and finally to the sensitive coating of the cell. It is desirable to furnish as much light as possible to the cell, because the strength of the minute currents flowing through it depends upon the amount of light entering. And the stronger the currents produced by the cell, the lesser the amount of amplifications needed for a given sound volume.

### Exciter Lamp Life

Since only one light source can be employed, and only a small part of that source used, it must be as brilliant as possible and of course its form must be such that it best fits the optical system. The brightness of a tungsten filament depends upon the temperature at which it is operated—the higher the temperature, the higher the brightness. And the operating temperature determines the life of the lamp—the higher the temperature, the shorter the life.

When a tungsten filament is incandescent, it gradually evaporates. This evaporation is evidenced by a black deposit of metallic tungsten on the bulb. The resulting thinning of the filament through this evaporation causes it to fail, and the rate of evaporation depends upon the operating temperature. Hence, as was stated previously, the life of the lamp is determined by the temperature at which it is operated, or by its brilliance.

### Filament Important

A lamp may be designed for any given life value by regulating the operating temperature of the filament. This is accomplished by correct selection of filament diameter and length. The proper economic life is determined by balancing service requirements against lamp cost. Most lamps intended for general lighting services are designed for an average life of 1,000 hours, although

\* Engineering Dept., General Electric Company, Nela Park.



the economic life value is in general somewhat lower than this.

For services which limit the number of lamps, yet which require high illumination, much shorter life is justified. For example, spotlight lamps have an average life of 200 hours; the 5 and 10 kilowatt lamps used in airport lighting and motion picture studio illumination have a life of 100 hours, and most projector lamps have a life of 50 hours.

The photo-cell exciter lamps, used in the reproduction of sound pictures have an average life of about 50 hours when operated at their labelled current value. Some lamps last less than 50 hours, others longer. Such variation is inherent in lamp manufacture. Incidentally, very rigid tolerances, testing, and selection attend the manufacture of exciter lamps because of the more stringent requirements of the service. Periodic life testing by the Mazda lamp manufacturers insures that the average life of a group of lamps remains very close to the design figure.

#### Operating Requirements

Operating the exciter lamps at a temperature which causes them to last an average of 50 hours produces very high brilliance and high light input to the photo-electric cells. Their average life may be increased by dropping the current below the rated figure, but this causes a great sacrifice in light output. The sacrifice in light necessitates increasing the amplification and hence the noise level. For the same sound volume, the ground noises then become more apparent. This fact is easily proved in the theatre by actual test.

A three per cent reduction in current below the rated value practically doubles the life of the lamp, but its light output is reduced by twenty per cent. It has been more or less general practice to operate these lamps at current values below that at which they were designed to operate. But when the expense of changing lamps more frequently is weighed against sound quality, it will be found that true economy dictates running the exciter lamp, the veritable dynamo of the sound reproducing system, at its full current value.

### New Televisor Employs Motion Picture Film

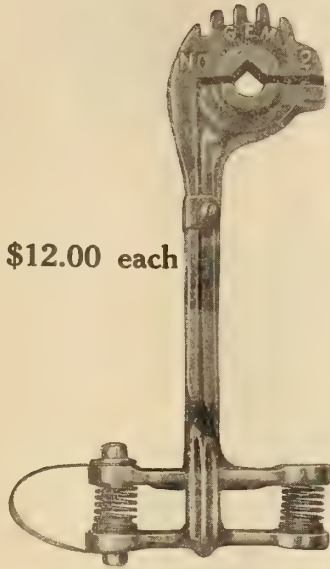
A specially designed television and receiving set has been manufactured by Wired Radio, Inc., which permits the passage of four times as much light as in the usual system. The scanning disk has perforations concentrically arranged and the set is for use with motion picture film exclusively.

At the transmitter, the entire picture is covered by having the film move one line at a time; that is, moving vertically, the distance between

*Save Money by Using the*

# GEM

\$12.00 each



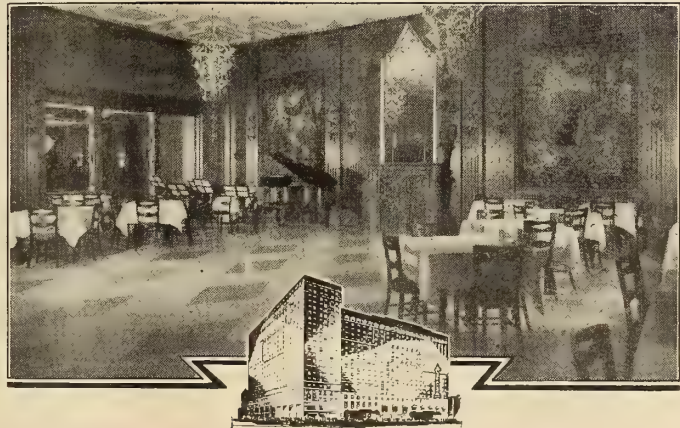
**H**ERE'S an opportunity to save money on your positive carbon jaw replacements. Note its unique design. Note the arrangement of upper and lower jaws, which compels the contact on the carbon to be constant, thereby reducing pitting and arcing to a minimum. Don't wait until your present jaw gives out, find out NOW about this unique device, or better yet order a spare now.

**FOGELBERG ENGINEERING CO.**

128 S. Clinton St.

Chicago, Ill.

*Sold by Reliable Independent Dealers Everywhere*



### THAT TRIP TO CHICAGO

will be made more enjoyable if you stop at the New Bismarck. A leader in all the improvements and luxuries that contribute to comfort, this hostelry enjoys a nation-wide reputation for good food and superior service. Quiet rooms, restful beds, reasonable rates, and easy accessibility to all business and social points.

*Write for booklet with downtown map*

**Rooms, \$2.50 Up—With Bath, \$3.50 Up.**

**NEW**  
**BISMARCK**  
**HOTEL CHICAGO**

RANDOLPH AT LA SALLE







## HIGH INTENSITY SPOTLIGHT

**MORE AND BETTER  
STAGE LIGHTING AT  
LESS EXPENDITURE OF  
ELECTRICAL ENERGY.**

**MOST REMARKABLE  
RESULTS ON LARGE  
STAGE SETS.**

**HALL & CONNOLLY, INC.**

24 Vandam St.

New York, N. Y.



each hole horizontally. The motion takes place continuously. The action is followed at the receiver by using a pivoted mirror that is caused to move by a spiral eccentric cam that is fastened to the shaft carrying the scanning disk. In this way the light from the concentrically arranged holes in the disk is made to cover the entire frame in which the complete image appears.

At the end of each line there is a large hole which puts a synchronizing beat on the carrier frequency, thus synchronizing the motor speeds for each picture.

### Another Scanning Method

Another method of film scanning makes use of shutter action, built into the scanning disk. In this form the scanning disk is divided into four equal parts, each of which carries a number of perforations arranged so that the entire picture is covered from top to bottom in somewhat less than a quarter of a revolution. Between these segments the disk is blank, so that there is shutter action.

The synchronizing impulse is sent during the blank between pictures, while the film is being moved a frame. Normally this would mean that the wave would be modulated only about 75 per cent of the time, but by means of a delay circuit the signal is made to take in the full time.

### A New Color Process

A new film color process has been successfully invented by Mr. R. S. Alldridge, the patent rights of which have been acquired by the Raycol British Corporation, according to a report from Alfred Nutting, Clerk, American Embassy, London, made public by the U. S. Department of Commerce.

The principle is stereoscopic, two lenses being used, one collecting the reds and the other the greens. The two pictures are overlaid in projection and shown through red and white, the result being that practically the entire spectrum can be presented, though blue and yellow are naturally the most difficult colors to get absolutely clear.

### Inexpensive Equipment

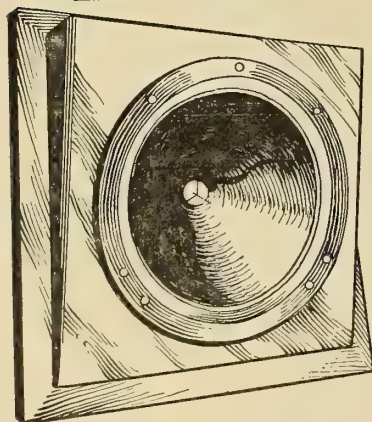
It is stated that the picture, as shown, combines well-nigh perfect registry of color with stereoscopic clearness, both of background and foreground; and that this is accomplished at a price which is no greater than that of an ordinary black-and-white picture, apart from the purchase of the actual camera. The projector also is reported to be extremely inexpensive, and that a picture can be taken, developed and reproduced on the screen in a single; and, further, that the new process is peculiarly adaptable both to sound pictures and to the probable arrival of the wide film.

*A Big Special—While They Last*

## \$110.00 PHOTOPHONE SPEAKERS



12-inch  
Dynamic



*Brand New  
in original  
cases  
Limited Quantity  
Order today*

**\$15**

Never before was such an astounding value offered. Every carnival owner, motion picture house, theatre, church, fair, American Legion Post, club, sound engineers and radio experimenters will want one.

12-inch Dynamic Field Supply; 110 volts D. C.; Field Resistance, 1000 Ohms; Voice Coil, 8 Ohms; Mountings, Steel angle frame. For adaptation to A. C. operations, \$6.50 additional.

*Terms: 25% with order; balance  
C. O. D. or Sight Draft.*

*Specify Express or Freight*

**M. & H. Sporting  
Goods Co.**

512 Market St., Philadelphia

**Subscribe NOW!—At present low rate of  
\$2.00 per Year**



### Photo-Electric Effect

Nobody knows why the current varies with the amount of light that enters the photo-electric cell. All anybody knows is *how*. It has been discovered that when light falls on certain metals electrons are given off, just as electrons are given off metals when they are heated. It has also been found that when the metals are put in a vacuum the number of electrons emitted by a given metal with a given amount of light is greater. Also, it has been found that certain metals emit electrons more readily than others.

For example, the alkali metals—sodium, potassium, and caesium—emit electrons copiously, and for that reason these and related metals are used in photo-electric cells. The photo-electrically active metals are deposited in a thin layer over the inside wall of the glass envelope of the cell and the light is admitted through a hole in this layer. Another metal electrode is placed in the center of the tube and a high voltage is impressed between the central electrode and the thin metal layer, with the positive terminal on the central electrode.

For a given voltage between the electrodes the number of electrons is, within certain limits, directly proportional to the amount of light energy that enters the cell. It is this proportionality that makes the cell particularly useful where freedom from distortion is essential. Another of its valuable properties is that the changes in the current through the cell vary instantaneously with changes in the amount of light.

### Reduce Emergency Calls

In a general letter to all the service men of Electrical Research Products, J. S. Ward, Service Manager, announces that the number of emergency calls to Western Electric equipped theatres during the last eight weeks, has been reduced to five percent of the number of routine calls. Previously the figure has been about 21 per cent.

This progress is in line with a concerted drive being made by Electrical Research Products to reduce the need for emergency calls to an absolute minimum.

### RCA Installations

Two hundred and twenty installations of sound reproducing equipment were made by RCA Photophone, Inc., in the United States and Canada during August and September. During the same period, but not included in the list, eighty-three complete equipments were shipped from the New York warehouses to foreign distributors, making a total of more than 300 contracts for RCA Photophone installation for the two months.

## ELIMINATE ALL TROUBLES WITH SOUND-ON-FILM

BY USING THE

# X CELL

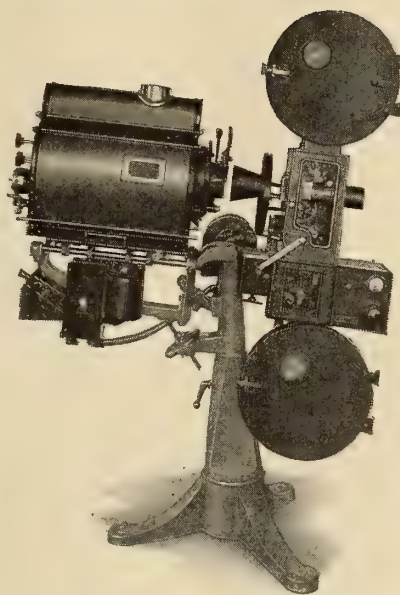
FULL THEATRE VOLUME WITH ONLY THREE  
STAGE AMPLIFIER

Long Life—Non-Microphonic—No Background Noise

MANUFACTURED BY

**PACIFIC RESEARCH LABORATORIES**

1489 W. WASHINGTON ST. LOS ANGELES, CALIF.



MODEL "U"

Announcing New Type "U"

## SUPERIOR PROJECTOR

Designed especially for the Universal adaptation of all Sound Reproducer Equipment.

The Outstanding Projector with the latest and best improvements for SOUND PROJECTION.

Improvements include: New Head Mechanism, Double Bearing Movement, Rear Shutter, Improved Framing Device, Quick Change-Over Mask, Starting Knob, New Mounting.

Manufactured by

**COXSACKIE HOLDING CORPORATION**

COXSACKIE, N. Y., U. S. A.

Send for descriptive circular

## F. S. C. COLORSHEETS

Defy the Heat

Replace common colored gelatines

Will not fade

Will not turn brittle

Samples on request

**FISH-SCHURMAN CORPORATION**

45 West 45th St.  
New York City

6364 Santa Monica Blvd.  
Hollywood, Calif.



## British "Operators" Win New Conditions

(From *The Bioscope*)

At a meeting last Friday, the Manchester branch of the C. E. A. ratified an agreement with the Electrical Trades' Union, whereby working conditions for operators are clearly determined. A report of the meeting appears among the C. E. A. proceedings in this issue.

The text of the agreement is as follows:—

**Hours of Work.**—Forty-eight hours to be a week's work. Where a full working week is less than 48 hours, payment for a full 48 hours to be made. Operators to be at the theatre at least half-an-hour before every performance, if necessary.

**Overtime.**—Time worked over and above 48 hours per week to be paid at the rate of time and one quarter; time worked after 11:30 p. m. at double time rate, with the exception of Wednesdays and Saturdays, when double time rates will commence after 12 (midnight), until starting time next day, irrespective of 48-hour week. All time worked on Sundays, Good Friday and Christmas Day to be paid for at double time.

**Holidays.**—One week's holiday, with pay, after six months' service to date from January 1st, any anomalies to be referred to the Conciliation Committee. Holidays to commence after the show on the Saturday night, thus giving the man two Sundays off. If called upon to work holidays owing to inability to obtain deputies, double time rates be paid to the operator. If the assistant or second be called upon to take charge during holidays or through other causes, he shall be paid an increase of 25 per cent of his ordinary rate. Such conditions to also operate in the event of second taking charge for absence through illness of the chief, or other causes.

**Duties.**—The operator to maintain in good repair and reasonable working order all electrical and mechanical and screen equipment. He shall be responsible for the collecting despatching and care of films. No other work to be recognized as operator's work. No operator to work without a full-time assistant. Where there is a "talkie" installation, he should have two full-time assistants.

**Rate of Wages.**—The minimum rate for an operator in Grade A hall to be £4 (approx. \$20.00) per week; Grade B, £3 10s. (\$17.50); Grade C, £3. Assistant operator to be paid 66% per cent of the chief operator's rate. Third assistant to be paid not less than £1 (\$5.00) per week. Where the rate of pay is more than the minimum at the time the agreement is signed, such rate shall remain for the said halls. Any anomalies to be dealt with by the Conciliation Committee.

**Termination of Engagement.**—One

week's notice to be given by either party.

**Membership.**—Reasonable facilities to be given to the representatives of the E. T. U. to visit all cinemas and theatres to interview their members, but not during performances.

**Conciliation Committee.**—A conciliation board to be formed consisting of a panel of six representatives from the C. E. A. and six representatives from the E. T. U., three of each side to form a committee with joint secretaries ex-officio.

**Existing Rates and Conditions.**—Where existing rates and/or working conditions are better than those provided for, no change shall be made so far as they affect the existing staff.

### STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of

### MOTION PICTURE PROJECTIONIST,

published Monthly at New York, N. Y., for October 1, 1930.

STATE OF NEW YORK } ss.  
COUNTY OF NEW YORK }

Before me, a notary Public in and for the State and county aforesaid, personally appeared James J. Finn, who, having been duly sworn according to law, deposes and says that he is the Editor of MOTION PICTURE PROJECTIONIST, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Mancall Publishing Corp., 45 West 45th St., New York City; Editor, James J. Finn, 45 West 45th St., New York City; Managing Editor, none; Business Manager, Boone Mancall, 45 West 45th St., New York City.

2. That the owner is: Mancall Publishing Corporation, 45 West 45th St., New York City. Boone Mancall, 45 West 45th St., New York City.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is . . . (This information is required from daily publications only.)

JAMES J. FINN,  
Editor.

Sworn to and subscribed before me this 19th day of September, 1930.

NATHAN REIGROD,  
N. Y. County Clerk's No. 55,  
Reg. No. 1R3

[Seal] (My commission expires March 30, 1931.)

## Index of Advertisers

Advance Labs, Inc. . . . . 41  
Ashcraft Auto Arc Co. . . . . 34

Bausch & Lomb Optical Co. . . . . 43  
Best Devices Co. . . . . 5  
Bioscope, The . . . . . 40  
Bismarck Hotel, The . . . . . 47  
Blue Seal Products Co. . . . . 39  
Brenkert Lt. Projec. Co. . . . . 36

Canadian Theatre Supply Co. . . . . 36  
Chalmers Publishing Co. . . . . 40  
Chicago Cinema Equip. Co. . . . . 32  
Coxsackie Holding Corp. . . . . 49

Dowser Mfg. Co. . . . . 7

Eastman Kodak Co. . . . . 33  
Enterprise Optical Mfg. Co. . . . . Cover  
Essannay Elec. Mfg. Co. . . . . 8

Fish-Schurman Corp. . . . . 49  
Fogelberg Engineering Co. . . . . 47  
Forest Electric Corp. . . . . 42  
Fulton, E. E., Co. . . . . 4

G-M Laboratories . . . . . 6  
Griffin Manufacturing Co. . . . . 40  
Griswold Machine Works . . . . . 46

Hall & Connolly, Inc. . . . . 48  
Hertner Electric Co. . . . . 37  
Hoffman & Soons, Inc. . . . . 45

Ilex Optical Co. . . . . Cover  
Imperial Electric Co. . . . . 3  
Instruments, Ltd. . . . . 42  
International Projector Corp. . . . . 10

Sam Kaplan Mfg. & Supp. Co. . . . . 2

M. & H. Sporting Goods Co. . . . . 48  
Mancall Publishing Corp. . . . . 9  
Mellaphone Corp. . . . . 44  
Movie Supply Co. . . . . 41

National Carbon Co. . . . . 5  
National Theatre Supply Co. . . . . 51  
National Tuberculosis Assoc. . . . . 38

Pacific Research Labs. . . . . 49  
Projection Optics Co. . . . . 44

J. M. Rice & Co. . . . . 47  
Roth Bros. & Co. . . . . 35

Schaefer Bros. Co. . . . . 46  
Strong Electric Corp. . . . . 6

Theatre Engineering Service . . . . . 32

Weber Machine Corp. . . . . 43  
Weston Elec. Inst. Co. . . . . 8





## IT PAYS TO MAKE IT A COMPLETE JOB

Equipping a theatre completely from one source is of greater value than its decided convenience. The Exhibitor who buys National Equipment from start to finish finds a wider range of theatre supplies, of drapery fabrics and carpet patterns, from which to make his selection. He is afforded the counsel and advice of specialists in every phase of theatre equipping. He profits by the all-inclusive guarantee of satisfaction that is an integral part of every National Purchase. He is protected by an unequalled maintenance service — always within his reach. Every dollar that he invests buys a full dollar's worth of merchandise . . . From every standpoint, it pays to make it a complete job—a National job.



This stamp of approval means quality . . . in materials, in workmanship, in practicability. Look for it in the advertisements of

theatre equipment manufacturers. Any product with which it is linked has passed National's rigid tests of excellence and is available at any National Branch.

**NATIONAL THEATRE  
SUPPLY COMPANY**  
*Branches in all Principal Cities*



*that the theatre patron is pleased.*

FRANCE POWER UNITS  
Phone Crescent 0066

PIERSON AND CEDAR  
CREEK CABINETS

H. G. DILLEMUTH

79 IVYHURST Rd.,  
EGGERTSVILLE, N.Y.  
(SUBURB OF BUFFALO)

NOTE- Make Express Shipments To  
363 FOX ST., BUFFALO

August 14th, 1930

Enterprise Optical Mfg. Co.,  
564 W. Randolph St.,  
Chicago, Ill.

Attention of Mr. Spahr.

Dear Mr. Spahr:

Believing that you will be interested in knowing how Motiograph Sound Projectors are performing, I am writing at this time to tell you about the installation at the Broadway Lyceum Theatre.

No doubt you were fully convinced that you had first class quality in your DeLuxe Sound Projectors before you released them for theatrical use, but I believe that you will feel as I do in this, that the most important person to be considered is the one who pays his or her admission price to hear and see the performance of the equipment. This is the person who ultimately pays for the equipment, so it does seem that his opinion is most important. It is the theatre patron who has volunteered much favorable comment on the sound projection at the Broadway Lyceum. One patron said he had seen a certain picture twice before he saw it shown at the Broadway Lyceum and considered this third performance the best of the three. That is what really counts - that the theatre patron be pleased. Every day new faces appear and they tell us that our sound has been recommended as being very good.

The interest you have shown in this installation is much appreciated, as for instance in sending on the new polished record weights without our asking for them, and after the equipment had been paid for in full, showing that there was no ulterior motive for your doing so beyond the desire that we be fully satisfied. From this and the peek the writer had into your laboratory while at Chicago, I feel that the users of Motiograph Sound Projectors will be in a favorable position no matter what developments come about. Since the first wide film projector the writer had the pleasure of seeing was a Motiograph Sound Projector, I know that when the change to this type is necessary (possibly in two or three years) it will not be necessary to scrap our present equipment, and that the cost will be within our means.

Trouble? Certainly we have had some minor trouble such as amplifier tubes becoming noisy and replacements necessary, but on only one occasion has our sound failed, and that required only replacing a blown fuse. Locating and replacing took less than five minutes.

From the first I was impressed with the extreme ruggedness of the Motiograph Sound Projector, but the more minute examination that almost four months contact has afforded, convinces me that everything about the equipment is built to take care of any emergency.

Yours very truly,

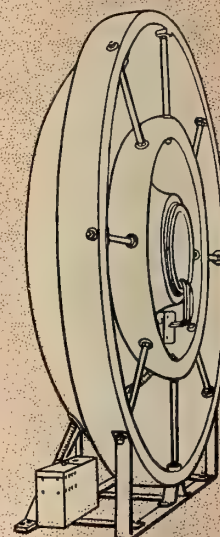
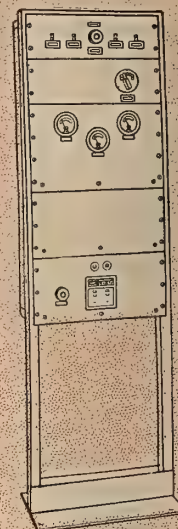
*H. G. Dillemuth*  
BROADWAY LYCEUM THEATRE.

**THERE ISN'T AN EXHIBITOR IN THE  
COUNTRY WHO CAN'T AFFORD TO  
BUY THIS GUARANTEED MOTIO-  
GRAPH DELUXE SOUND EQUIP-  
MENT—**

*and it's backed by 25 years of real projector-  
building experience.*

*Write for prices*

**THE ENTERPRISE OPTICAL MFG. CO.  
564 W. Randolph St., Chicago, Ill.**





# MOTION PICTURE PROJECTIONIST

(Fourth Year of Publication)

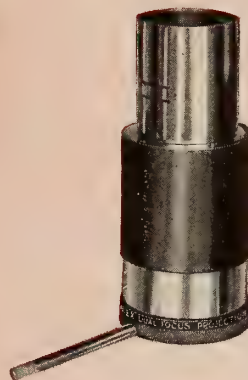
**ILEX**

**F:2.5**

**DUAL FOCUS**

**PROJECTION LENS**

A SINGLE LENS  
FOR A DUAL  
PURPOSE



SOUND ON FILM  
SILENT OR DISC

The Ilex F:2.5 Dual Focus Lens, adapted for use with either sound-on-film or sound-on-disc, is becoming recognized as an absolute necessity for sound equipped theatres. When either of the above types of film are run, the same size screen covering is maintained by a shift of the lever. In addition to the above feature, maximum sharpness, flatness of field, brilliant illumination, coal blacks, snow whites, are truly Ilex characteristics.

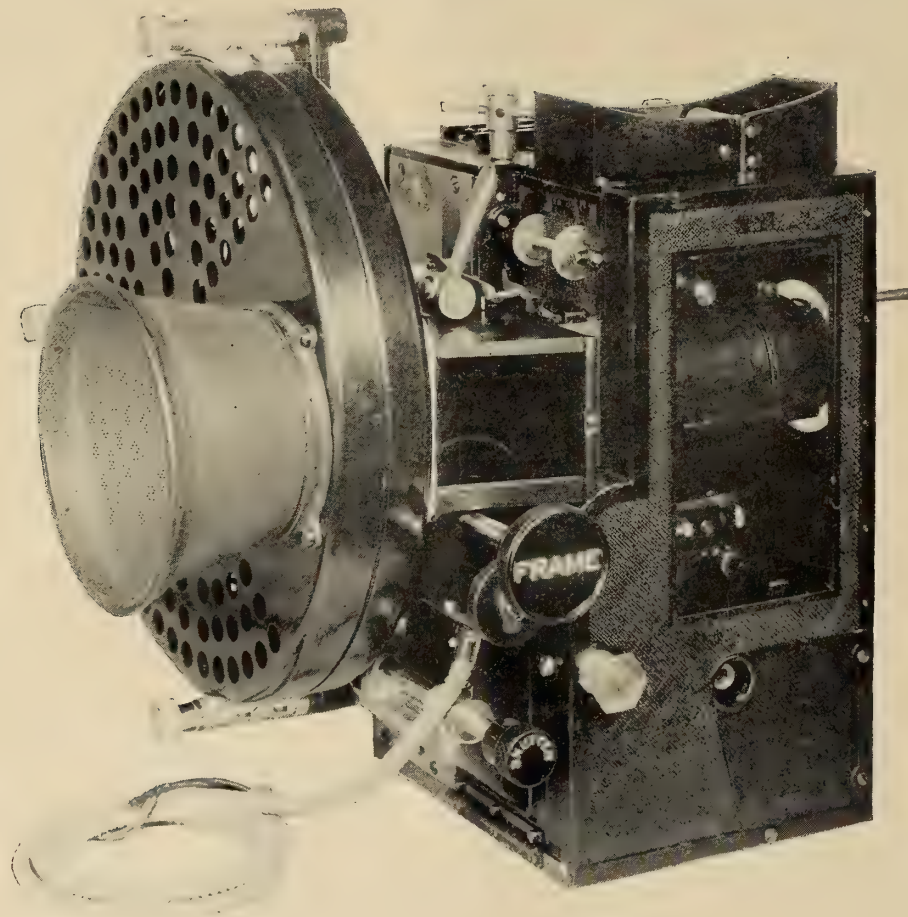
**ILEX OPTICAL COMPANY**  
ROCHESTER NEW YORK

INSIST UPON ILEX AND BE PATRON INSURED



*Now Ready!*

# KAPLAN REAR SHUTTER



Can be Attached to Any Sure-Fit  
or Simplex Mechanism

*See your local dealer or write to us*

**Sam Kaplan Manufacturing and Supply Company, Inc.**

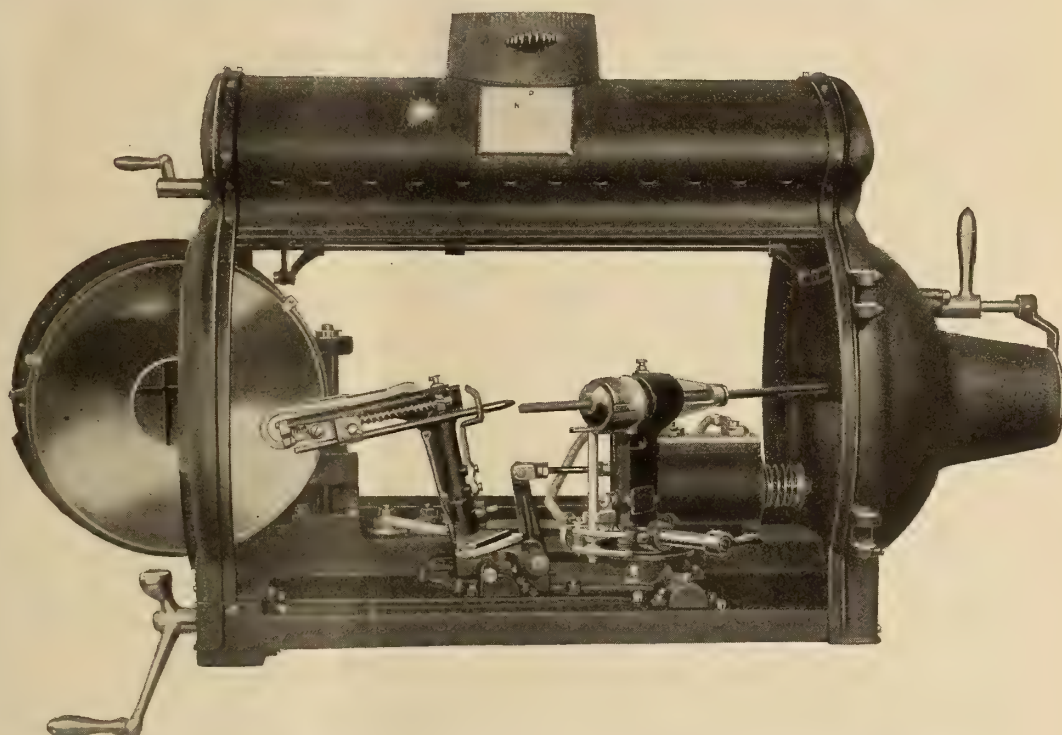
729 Seventh Avenue

New York City



THE  
ONE  
LAMP  
HAVING  
A  
LIGHT  
PRODUCING  
RESERVE  
CAPABLE  
OF  
DELIVERING  
ANY  
REQUIRED  
SCREEN  
BRILLIANCE

THE  
*Peerless*  
"The Super Reflector Arc Lamp"  
AUTOMATIC  
HIGH INTENSITY  
REFLECTOR ARC LAMP



USED BY THE MAJORITY OF THE NATION'S GREATEST  
THEATRES

TO obtain that "Snap" and "Pep" so necessary to a perfectly projected "Sound," "Silent" or a "Magnafilm" picture, it is absolutely necessary to deliver to the screen the utmost in "LPA" (Light Per Ampere).

From an economy standpoint the utmost in "LPA" is also vital.

Peerless High Intensity Reflector Arc Lamps are a necessity for the perfect projection of Sound Pictures. Its distinctive features are many, their ability to deliver uncomplainingly is an inbuilt quality.

Correct engineering principles and precision standards employed in their manufacture have personified in the name "PEERLESS" unapproachable leadership in its field.

The first cost of Peerless High Intensity Reflector Arc Lamps is no more than what can be paid for less and as for maintenance expense?—far less than any.

"LIGHT PUTS LIFE IN YOUR PICTURE"

MANUFACTURED BY

J. E. McAULEY MFG. CO.

552-554 W. Adams Street

Chicago, Ill.



# *Simplex*

TRADE MARK REG'D.

THE INTERNATIONAL PROJECTOR

USED BY

# THE ASTORIA CHAIN

## THE FINSBURY PARK ASTORIA

LONDON, ENGLAND

EVIDENCE OF BRITISH PROGRESSIVENESS

and

SIMPLEX SUPREMACY

EQUIPPED WITH

FOUR

# *Simplex*

TRADE MARK REG'D.

# PROJECTORS

THE FINSBURY PARK ASTORIA  
ISLINGTON, LONDON, ENGLAND

"The projection and talking picture machinery is the most complete of its kind in any theatre to date.

"In the Modern Theatre—Machinery rules."

**DIRECTORS:**

E. A. STONE, F.S.I., Chairman  
A. SEGAL, Managing Director  
J. C. CLAVERING  
ALBERT LESSER  
ARTHUR LESSER  
HENRY LESSER

**GENERAL MANAGER:**

CHARLES PENLEY

**SECRETARY**

H. T. RICHARDSON

**ARCHITECT:**

E. A. STONE, F.S.I.

**GENERAL CONTRACTORS:**

GRIGGS &amp; SON

**CONSULTING ENGINEER:**

MAJOR C. H. BELL, O.B.E.

**INTERNAL DECORATIONS:**

MARC-HENRI &amp; LAVERDET

**RESIDENT MANAGER:**

E. L. DIMMOCK

THE FINSBURY PARK ASTORIA is the fourth Theatre to be opened in the chain originally visualized by the Directorate two years ago. The Theatres already opened include the Brixton Astoria (August, 1929); the Old Kent Road Astoria (February, 1930); and the Streatham Astoria (June, 1930). To open four Theatres of the magnitude of the Astorias in just over twelve months is a record of which the Directorate are justifiably proud, while the success of the Theatres already opened is confirmation that the policy originally laid down and carried out was a wise one.

The policy of the Directorate is to provide:—

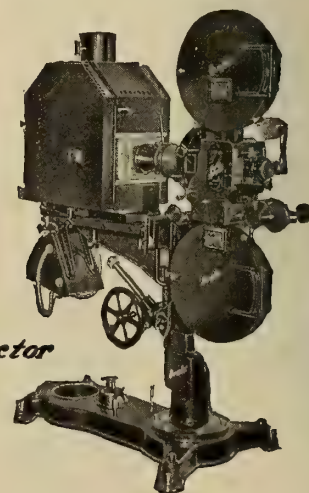
- (1) Theatres of Unequalled Size and Magnificence in suburban areas.
- (2) Entertainment unexcelled by even West End of London Houses.
- (3) Music by picked Orchestras and Grand Organs.
- (4) Comfort, Courtesy, and Service.
- (5) Strictly suburban prices.

THE ASTORIAS have been acknowledged by the Press of this country—and America—to be real super Theatres presenting super Entertainment in Pictures, Vaudeville, Stage Production, and Music, and the ideals which have proved so successful and acceptable will be continued.

The Directorate and Management are sincere in their endeavors to raise the standard of Entertainment and Entertaining, and the maintenance of their declared policy is accepted as a duty to the public they serve.

A. SEGAL.

*Simplex*  
The International Projector



# INTERNATIONAL PROJECTOR CORPORATION

90 GOLD STREET

NEW YORK



# MOTION PICTURE PROJECTIONIST

December, 1930

Vol. 4, No. 2

JAMES J. FINN, Editor

Lester Isaac, *Efficiency*; J. H. Kurlander, *Light*; Arthur Gray, *Conservation*; John Kieley, *Equipment*; Samuel Wein, *Research*; R. H. McCullough, *Sound Projection*; Harry Rubin, *Improvement*; Victor Welman, *Personnel*; Sidney Burton, *Production*.

Published monthly by Mancall Publishing Corp., 45 West 45th St., New York City. Subscription rates in U. S. and Canada: twenty-five cents per copy; two dollars per year; three dollars for two years. Add one dollar for foreign postage. Changes of address should be submitted three weeks in advance of publication date to insure receipt of current issue.

Entered as second class matter Oct. 25, 1927, at Post Office, New York, N. Y., under the act of March 3, 1879.

## Canadian Representative

H. N. Elliott, Suite 11, 27 Sherwood Ave., Toronto, Canada.

## Australian Representative

McGill's Agency  
179 and 218 Elizabeth St.  
Melbourne, Australia

## Editorial & Advertising Office

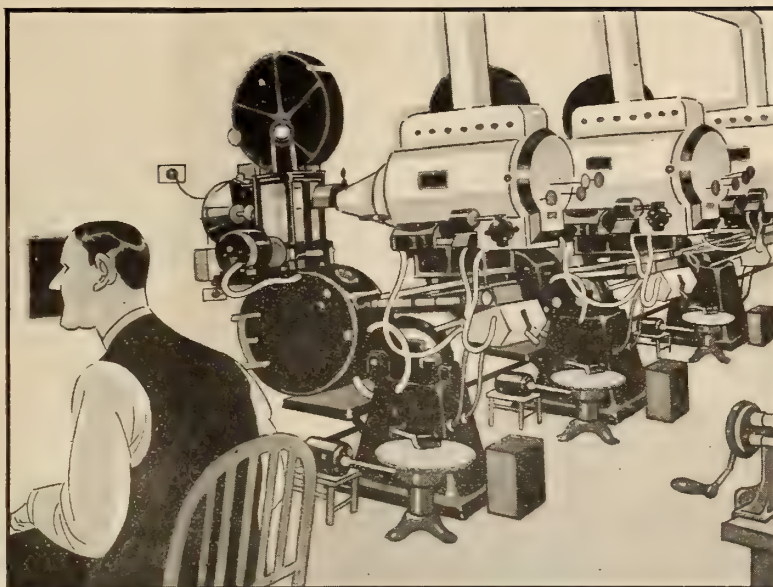
45 West 45th St.  
New York City



## Academy Awards for Year's Best Production Work

Awards of merit for outstanding individual achievements in motion pictures were announced and presented by the Academy of Motion Picture Arts and Sciences Wednesday night. The ceremony, which is an annual event, was attended by 500 Academy members and guests. It was held at the Ambassador Hotel. The Awards were determined by ballot of the Academy membership, based on feature pictures released in Los Angeles during the year ending July 31, 1930.

The Academy Awards were as follows: Performance by actress: Norma Shearer for "The Divorcee"; Performance by actor: George Arliss for "Disraeli"; Achievement by director: Lewis Milestone for "All Quiet on the Western Front"; Outstanding production: "All Quiet on the Western Front", Universal Studios; Cinematographic achievement: "With Byrd at the South Pole", Willard Van Der Veer and Joseph T. Rucker, jointly; Art direction achievement: "King of Jazz", Herman Rosse; Sound Record-



## National Projector Carbons are more economical

THE NATIONAL PROJECTOR ORO-TIP NEGATIVE CARBONS will not pencil under high intensities. This prevents sputtering and flickering pictures. An arc produced with these carbons, and National Projector Positives, insures such effortless ease of projection that the audience will be free to enjoy the picture on the screen. The positive carbons form deep, well-rounded craters. This helps to convert a greater percentage of electrical current into light rays . . . thus giving *more economical projection*.

NATIONAL CARBON CO., INC. Carbon Sales Division: Cleveland, Ohio

### BRANCH SALES OFFICES

New York, N. Y. Pittsburgh, Pa. Chicago, Ill. Birmingham, Ala. San Francisco, Cal.

Unit of Union Carbide  and Carbon Corporation

## NATIONAL PROJECTOR CARBONS

IN WESTERN CANADA!

## CANADIAN THEATRE SUPPLY CO.

Authorized distributors for

**SIMPLEX—MOTIOGRAPH—POWERS—HOLMES**

and all theatre equipment of the leading manufacturers. Also, an extensive line of stage equipment.

**Complete Sound Picture Service!**

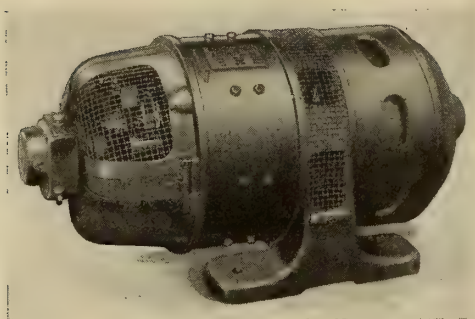
**306 Canada Building  
Winnipeg, Man., Canada**

Alberta Representative

**M. L. ADAMSON**

9921—113th St., Edmonton, Alb., Canada





20/40 to 100/200 Ampere 2-Bearing Actodector

## ARCS OF UNIFORM INTENSITY

Projection arcs of unvarying brilliance and uniform intensity—even during change-overs—are assured by the use of Roth Actodectors. They are particularly suited to sound equipment because of their quiet operation which results from proper design, liberal proportions, dynamic balance and exceptional commutation.

Furnished in both 2-bearing and 4-bearing types—Various sizes from 20 to 600 ampere capacity—Standard voltages of 75, 85 and 100 volts.

### ROTH BROTHERS AND COMPANY

*Division of Century Electric Company*

1400 W. Adams St.    » » »    Chicago, Ill.

**"THEY KEEP A-RUNNING"**

**KEEP all your COPIES of**

**MOTION PICTURE PROJECTIONIST  
AS A REFERENCE FOR CURRENT  
AND FUTURE NEEDS—PRE-  
SERVE THEM IN A  
BINDER**

**\$3<sup>00</sup>**  
**each**

**GOOD SOLID  
IMITATION LEATHER  
—GET ONE**

**ORDER FROM THE MOTION PIC-  
TURE PROJECTIONIST**

ing achievement: "The Big House". Award to the Sound Department of Metro-Goldwyn-Mayer Studios; Writing achievement: "The Big House", Francis Marion.

Will H. Hays, President of the Motion Picture Producers and Distributors of America, Inc. was a guest speaker. Another feature was an address through the medium of a talking picture of Thomas A. Edison, who with George Eastman, has been elected to honorary membership in the Academy. Due to the unavoidable absence of William C. de Mille, president, Conrad Nagel, vice-president of the Academy, presided.

### Resistor or Insulator?

Certain delicate circuits developed particularly in conjunction with photo-electric cell work, have brought about a demand for resistance values of the order of hundreds of megohms, or hundreds of millions of ohms. In fact, these high resistance values approach those of some of the common insulating materials in general use, and the question naturally arises, when is a resistor an insulator, or when is an insulator a high-resistance conductor?

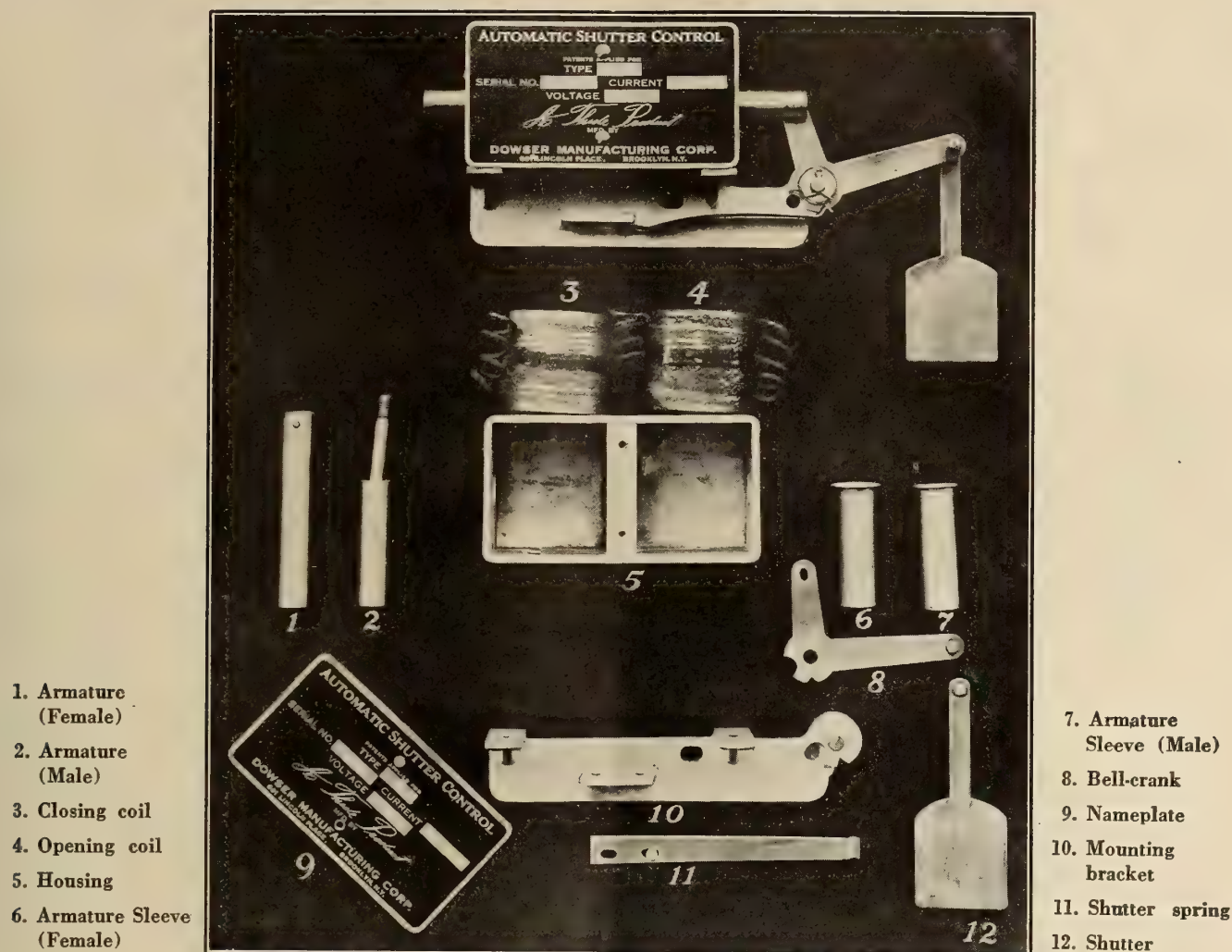
Never before, states Francis R. Ehle, President of the International Resistance Company, has there been such demand for extremely high resistance values. For one thing, in the past there has been no practical or economical means of obtaining resistance values of hundreds of megohms. The wire-wound resistors are obviously out of the question, due to their high cost as well as considerable bulk in such high resistance values. Carbon in solid and coated form, has not been satisfactory for accurate high resistance values. Fortunately, the metallized resistor technique, whereby a metallic coating is applied to a glass thread or filament, forming a permanent resistor, has made possible the extremely high resistance values. Such metallized resistors are quite similar to the usual units employed in radio sets, except that the metallized filament is contained in a heavier glass tubing, and the unit measures six inches long and over for the highest resistance values. Units are made in resistance values as high as 200 megohms.

### Harris S. M. P. E. Editor-Manager

The Board of Governors of the Society of Motion Picture Engineers has announced the appointment of Silvan Harris as Editor-Manager. Harris has a background of many years of technical editorial and scientific work and leaves a position with the Fada Radio Corporation to accept this new work. Before joining Fada he was managing-editor of "Radio News" for two years and served for several years as Director of Radio Research and Design for the Stewart-Warner Speedometer Corporation.



# The Changeover Adopted as Standard Equipment



MODEL D for Simplex, Super Simplex and Surefit  
(With or without Rear Shutter Mount)  
MODEL B—for Motiograph F

“THIDE”

## AUTOMATIC SHUTTER CONTROL with 3-WIRE CIRCUIT FOOT SWITCH

Simplicity for mounting—  
Properly positioned—

Electrically efficient—  
Mechanically proficient

Adoption of the new REAR SHUTTER mount necessitates a change in design for mounting the changeover.

Your (MODEL A.) changeover will be replaced with the new (MODEL D.) with a liberal allowance for the (MODEL A.) Type.

In use by Roxy, Loew, R-K-O, Fox, Warner, Publix, Wilmer & Vincent and others.

Your Dealer or Write

### DOWSER MANUFACTURING CORP.

691 Lincoln Place

Brooklyn, N. Y.

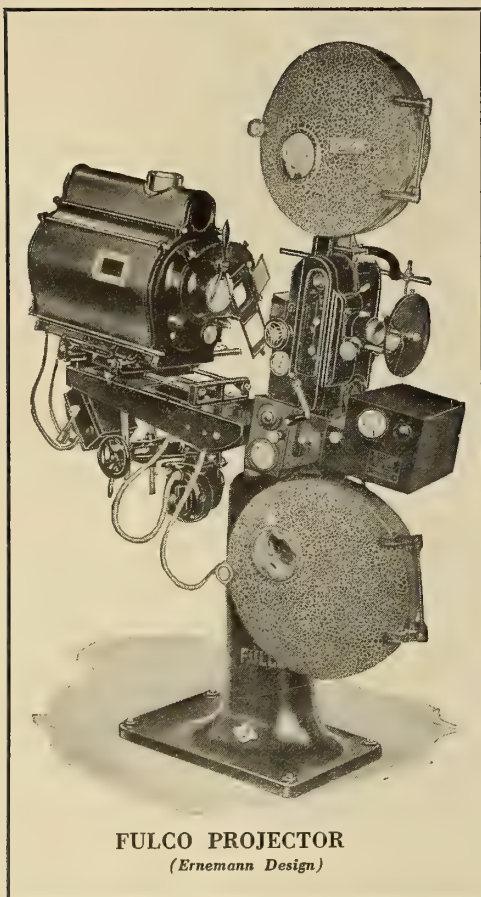


---

**WORLD'S BEST THEATRE EQUIPMENT**


---

# COMPARE!



FULCO PROJECTOR  
(Ernemann Design)

On demonstration at all E. E. Fulton Company branch offices located in the following cities:

CHICAGO ..... 1018 So. Wabash Ave.  
 NEW YORK ..... 115 W. 45th St.  
 BOSTON ..... 65 Broadway  
 PHILADELPHIA ..... 1337 Vine St.  
 ATLANTA ..... 146 Walton St.  
 LOS ANGELES .... Film Exchange Bldg.  
 ST. LOUIS ..... 3232 Olive St.  
 MILWAUKEE ..... 151 Seventh St.  
 INDIANAPOLIS ..... 340 No. Illinois St.  
 SAN FRANCISCO ... 255 Golden Gate Ave.

## Fulco—Point by Point— With Any Other Projector

Comparison will convince you beyond a doubt that Fulco is the most efficient picture machine in existence.

If you are about to buy projectors, it will be well worth your while to visit our headquarters, or any Fulco branch, and see the Fulco side by side with competing machines.

With comparisons made before your eyes, you will be astonished at the many valuable features exclusively built into the Fulco Projector—improvements which make it the greatest projector on the market today.

The machine which appeals to the man who knows all about projection as well as the man who knows all about show business.

- ☞ Low Initial Cost
- ☞ Lower Maintenance
- ☞ More Dependability
- ☞ Better Projection

---

Ask the Man Who Owns or Operates One!

---

# E. E. FULTON COMPANY

C. H. FULTON  
President

A. G. JARMIN  
Treasurer

Executive Offices: 1018 So. Wabash Ave., Chicago    Factory: 2001-2007 So. California Ave., Chicago




---

**E. E. FULTON COMPANY, COAST to COAST DISTRIBUTORS**

---



## A Tribute to the Projectionist

OCCUPYING a prominent place in the theatre section of a recent Sunday issue of *The New York Times* and extending more than a column in length is the following contribution by the motion picture critic of that newspaper to the efficiency of the projection room crew at the Paramount Theatre in New York City. This comment was inspired by a recent tour which the *Times* critic made through the Paramount Theatre under the guidance of representatives of the Projection Advisory Council, the meeting having been arranged subsequent to the appearance in the *Times* of rather unfavorable comment on the projection work at one of the big-picture openings. The article follows:

The motion picture has found its voice, but the discovery has not subtracted from the worries of the exhibitor. Sound mechanism has, in fact, given audiences a new critical sense of the fitness of things cinematic and has resulted in new problems. Talking pictures are no longer novel and they cannot presume to get by in the face of the little flaws in sound reproduction which once went unnoticed.

Every sound on the motion picture set is recorded by the microphone and duly reproduced in the theatre. Once recorded, it cannot be removed without destroying every other sound in that particular section of the narrow track which runs alongside the film.

A speck of oil or dirt is detected by the photo-electric cell and reproduced as an individual noise, usually grotesque and discordant. A spot of ink on the sound track, as many projection room mechanics have found to their sorrow, comes out with a most obnoxious rattle and bang from the amplifiers. A thumb-nail scratch produces a major explosion with minor noises like the sound of flying shrapnel.

### Regulating Speed

The first talking pictures had no arrangement for regulating the speed of the film as it unwound in the projection machine. This was the most serious flaw in early sound pictures. The faster the film—and the sound—moves through the aperture, the higher the frequency, bringing with it high pitch which sometimes becomes a tremolo. Mechanisms now maintain within very close limits the speed with which the film is projected through the machine.

The show hangs by threads and hairlike springs in the mechanism, far from the stage. But successful sound reproduction is more than a matter of machinery. There is the human equation to consider, and, everything else functioning smoothly, it is on this that the finesse of the talking picture performance depends.

### A Special Observer

The noises of the crowd, laughter, the shuffling of feet, applause, come only remotely to the men in the projection room. Paramount has an observer in a strategic part of the audience continuously. By a system of buzz signals he informs the projection room how the performance is going and directs it to raise or lower the volume of sound so that the voices of the performers may be heard clearly but not loudly.

But flaws cannot be eliminated entirely. They can only be minimized. Frequently studios send out poor prints and nothing the projectionist can do will remedy basic faults which originated in the studios. Six prints of the Gloria Swanson picture, "What a Widow!" were rejected here and even the one finally selected for the premiere was imperfect.



~top speed  
and snappy  
quietness

THAT'S WHAT YOU WANT AND  
EXACTLY WHAT YOU GET *with*



## CHANGEOVER DEVICES

In this speedy age, where "snap and go" is required in every projection room, *Strong Scientific Development and Construction* offers you three big factors: high speed, high efficiency and quiet operation. That's why Strong is always mentioned enthusiastically whenever changeovers are discussed.

Do it electrically! Manually operated changeovers are back numbers—why step backward? Step on the Strong Foot Switch (patented)—quick as a flash and noiselessly the change is made—no fumbling for levers or other hand operated gadgets. Strong coils DO NOT BURN OUT.

*There's a model to suit every condition and to fit every projector, including the NEW STRONG SUPER for Super Simplex and others with rear shutters.*

Write Us Now or Ask Your Supply House  
for Our New Booklet:

*"Meeting the Needs of the Projectionist"*

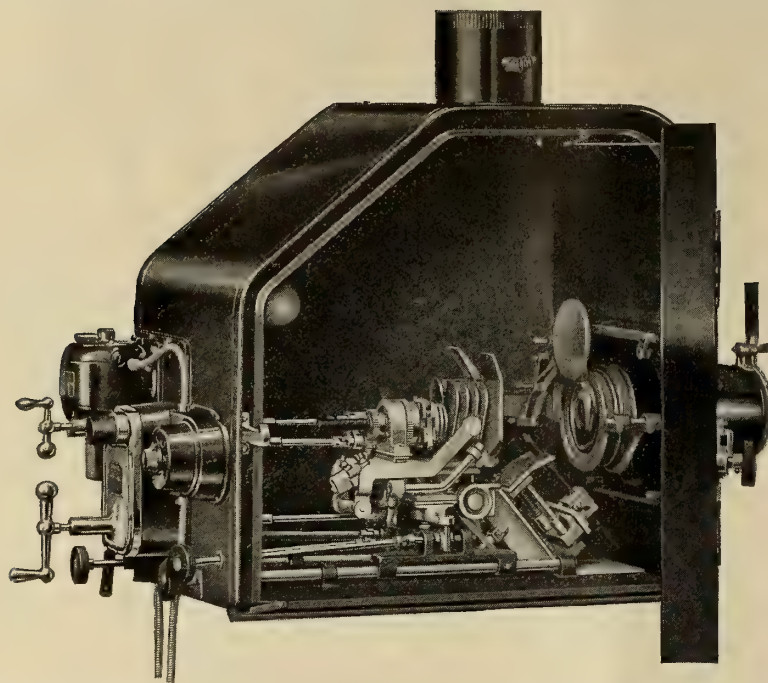
**ESSANAY ELECTRIC  
MANUFACTURING CO.**

2809 WEST VAN BUREN STREET CHICAGO, ILL.



# ASHCRAFT

## SUPER HIGH INTENSITY PROJECTION LAMP



**T**HE ASHCRAFT Super High Intensity Projection Lamp is now used as a projection standard where exceptionally fine projection is required. Not only is this lamp superior for wide film, but is now being used with standard film in the largest theatres with an enormous increase in illumination.

*Catalog is now available for distribution*

**ASHCRAFT AUTOMATIC ARC COMPANY**  
4214 SANTA MONICA BOULEVARD  
HOLLYWOOD, CALIFORNIA

**Give This to Your Friend—Have Him Fill It in and Mail to us at Once**

The Motion Picture Projectionist  
45 West 45th Street, New York City

Gentlemen:

Enclosed please find \$2.00 for which enter my subscription for one year (12 issues) starting with .....issue. (Two years, \$3.00.)

Name .....

Street .....City .....

State .....Local No. ....

### Concerning Color

After a veritable orgy of color, in which producers and art directors apparently lost all sense of balance or good judgment, color "has taken one on the chin," as they say in the language of the prize ring. This is too bad, for color, judiciously used, is a real asset to a picture which naturally calls for color.

True to tradition, the producers have turned away from color in just as apparently a silly way as they turned to it at the start of the great color period that has just ended. But color will not die out. Color is here to stay, despite the fact that the public has been fed up on a lot of very bad color, color which was splashed in just for the sake of making the picture colorful. Three intelligent papers on color were read at the recent S. M. P. E. meeting in New York, and a few producers are wisely figuring out that, if intelligently used, color will enhance a picture that calls for it.

#### A Fine Example

Take, for instance, the picture "Whoopie." There is an example of what can be done with color if it is used wisely and the proper care taken in the making of the prints.

Von Stroheim returned from abroad the other day, and had scarcely set foot on shore when he declared that color is needed in the ideal picture. His objection to color in the past has been that it has been unnatural. If a real three-color process can be developed, and the producers can be influenced to use color only where it is called for, the future for color should be bright.—*American Cinematographer*.

#### 7,170 W. E. Installations

Western Electric world-wide installations, according to the latest report, total 7,170 of which 4,701 are in the domestic field 2,469 abroad. Indicating how talking picture patronage is distributed among cities, H. M. Wilcox, operating manager of Electrical Research Products, has prepared statistics showing the distribution of Western Electric sound systems by cities.

Sixteen cities have 20 or more installations. The list is headed by New York City with 356. The other cities are as follows: Chicago, 166; Los Angeles, 86; Philadelphia, 82; Detroit, 76; Cleveland, 51; St. Louis, 46; San Francisco, 41; Baltimore, 40; Kansas City, 32; Cincinnati, 32; Milwaukee, 30; Seattle, 29; New Orleans, 26; Buffalo, 26; and Pittsburgh, 22. There are 23 cities that have between 11 and 20 installations, totaling 341 Western Electric wired houses. In 75 cities there are from 5 to 10 installations, the theatres involved numbering 75. 48 cities have four each and include 192 theatres, while there are 113 cities with three installations. These total 339 theatres.



# IMPERIAL M-G SETS

*are especially designed for*

## MOTION PICTURE

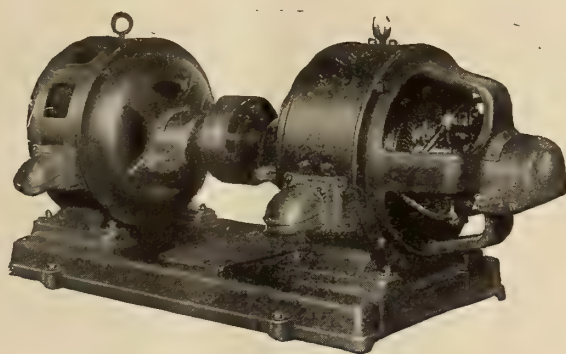
# PROJECTIONISTS

Imperial Motor Generators used in Projection Booths are especially designed for that purpose. That is why they have proven so universally satisfactory.

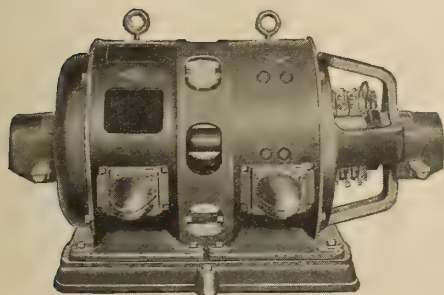
They were designed to enable YOU to obtain that high

quality of Projection that you are constantly striving for.

Imperial M-G sets serve YOUR interest because they enable you to give the kind of Projection that satisfies your audience.



For Large Theatres



For Small Theatres

### OUR BUSINESS CREED

**1 QUALITY 2 SERVICE**

**3 RIGHT PRICES 4 COURTEOUS TREATMENT**

*Consult Your Dealer or Write Us.*

## THE IMPERIAL ELECTRIC CO.

*Established 1889*

**AKRON**

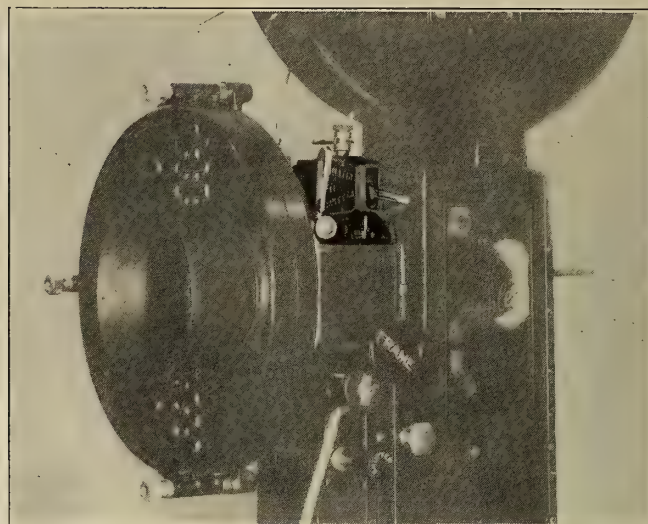
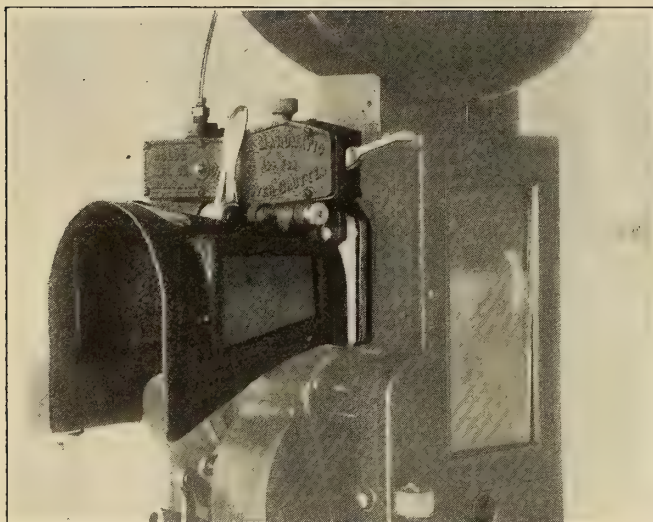
*Branches in Principal Cities*

**OHIO**



# BELIEVE IT OR NOT

*What May Seem Like  
a Backward Step Can  
be a Leap Forward*

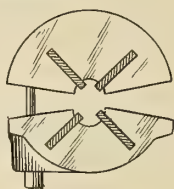


Above—Installation on Rear Shutter Simplex Projector

Left—Installation on Regular Model Simplex with complete Framing Light Shield

## The "GoldE" Manumatic Changeover Shutter

and here's another  
GoldE Perfection—  
a carbon jaw  
for Hi-Lo  
lamps that  
won't burn  
up!



This new GoldE Long-Life Carbon Jaw is **GUARANTEED FOR SIX MONTHS**—check that against your past experience with carbon jaws and consider the saving in trouble and cost. Besides we guarantee proper carbon rotation, perfect alignment and current conduction through its long life.

This new jaw is an answer to the prayers of troubled projectionists. Price each..

**\$15.00**

**FREE!** As an introductory inducement for a limited time, we will include with each pair of GoldE Long-Life Carbon Jaws, one of the new GoldE Carbon Jaw Laps for cleaning and resurfacing. **ORDER NOW.**

It does not use electricity, yet it does its work by simple manual operation and mechanical connection in a more quiet and efficient manner than any other changeover device ever developed. No troublesome magnets, solenoids or costly wiring.

GoldE Manumatic is the only changeover shutter that makes a **QUIET**, positive, **SPEEDY** (1/200th second), changeover for two projectors, every time—not once in a while. No blades to stick; no switches to miss contact, not a chance for a slip up. The whole works right at the projectionist's finger tips. It works by gravity.

No boom or bang in your Movietone pickup—but a quick, positive changeover unseen and **UNHEARD** by the audience.

Low installation cost—a few minutes to connect and tighten up four screws and a two-machine hook-up is ready for operation. No cutting, filing or drilling required.

**OTHER FEATURES:** Novel tension pad release—easily accessible—no more burnt knuckles; automatic fire shutter lift for easy inspection and setting of film aperture; new design cooling plate—combination transite and "waffle" cast plate which reflects and absorbs heat from tension pad and mechanism. For front shutter Simplex it combines with the GoldE Framing Light Shield as a complete unit.

**POPULAR PRICE:** The GoldE Manumatic Changeover Shutter complete for two machines, with instructions for easy installation, costs less than one changeover of other types. Price for two devices, **\$45.00** f. o. b. Chicago, only .....

UNQUALIFIEDLY GUARANTEED BY

**GOLDE MANUFACTURING CO.**  
2015 LeMoyne Street CHICAGO, ILL.



# The Elements of Optics

By SIEGFRIED S. MEYERS†

WHEN a stone is thrown into a quiet pond, a series of water waves are at once apparent, resulting from the disturbance of a certain area of the water, which is transmitted to the next area until the initial disturbance is transmitted by means of a series of water waves to the shore. Whoever has observed a stick or cork floating near the shore of a beach certainly has noticed that although the waves themselves wash up against the shore in rapid succession, the stick remains in its same relative position, merely bobbing up and down as the waves pass under it. Such waves are called transverse waves; and light waves are known to function in the same manner as water waves.

According to most recent scientific calculations, it has been found that light travelling through inter-stellar space from the sun to the earth, does so at the stupendous rate of 186,242 miles per second. That is to say, that each second which elapses from the time a light impulse leaves the sun, a distance of 186,242 miles is traversed. It has long been known that there is empty space between the earth and sun, and that this space can be regarded as a vacuum; and furthermore, that if this space were not a vacuum, but were filled with air or some other material substance, light would not travel at the rate of 186,242 miles per second, but would tend to be retarded. Hence, we conclude that the velocity of light is not constant for all mediums, but rather varies with the inherent density of that medium.

Thus, if a beam of light were to pass through a thick piece of glass, and another beam through an evacuated vessel of the same size, we should expect the velocity of light to be greater in the latter case, for it has been retarded in the former.

## Light Wave Lengths

Now, ordinary light is distinguished from other kinds of light by means of the length of the wave. We mean by this, that a wave of light has a fixed length which is commonly called its *wave length*. The wave

length of this light depends upon the distance between one wave crest and the next one, just like we can measure the wave length of a water

of the plate glass, that part of the wave striking first will be retarded. While that part of the wave is being retarded, the remaining part of the

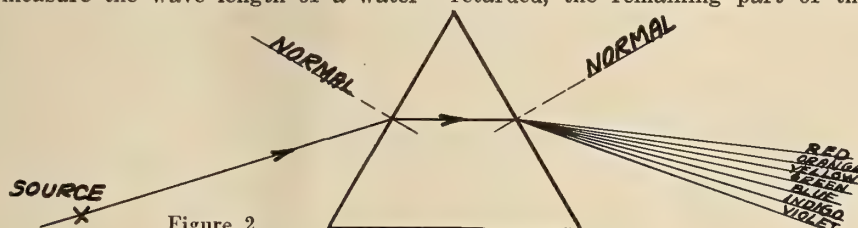


Figure 2

wave by observing the distance between the crests of two consecutive waves. Thus, if we know the velocity of light, and if we know the length of the wave, we can easily determine how many of those waves will pass between two fixed points in a given time. The number of waves passing between two points in unit time is known as the *frequency* of the light. In other words, the characteristics of a particular beam of light are obtained by the following relationships:—

1. Frequency =  $\frac{\text{velocity}}{\text{wave length}}$
2. or: wave length =  $\frac{\text{velocity}}{\text{frequency}}$
3. or: velocity = frequency  $\times$  wave length

Knowing that light is a wave motion which vibrates at a certain frequency and has a given wave length, we are ready to see what happens to the speed of that wave as it passes through various mediums. Suppose two runners of equal speed take off at the mark, and runner A travels on a cinder track while runner B travels on one of sand. Obviously, runner A will cover a given space in a shorter time than will runner B. In short, A's velocity through the medium of cinder is greater than the velocity of his opponent through sand. Similarly, with light, certain substances offer less resistance to a beam of light than do others.

Let us consider a ray of light passing from a given point through a piece of thick plate glass.

We know that the light travels through air at the usual speed of light, but when it strikes the surface

of the plate glass, that part of the wave striking first will be retarded. While that part of the wave is being retarded, the remaining part of the wave has a chance to travel through the air at the speed of light thereby causing a bending of the ray at the surface of the glass plate. At this point it should be noted that any line which is perpendicular to a surface is said to be normal to it. Therefore, this piece of plate glass has an imaginary line drawn at right angles to its plane surface, and this line is called the normal.

## Refraction

Now, when the ray of light, which is commonly called the *incident ray*, approaches the glass plate, part of the incident ray is slowed up while the other part is still travelling with the speed of light in air. As a result, the incident ray is bent at the surface of the plate, and tends to bend toward the normal. In brief, whenever an incident ray travels from a less dense medium to a more dense medium, it bends toward the normal; and whenever it travels from a more dense medium, like glass, to a less dense medium, like air, it is bent from the normal. Consequently, this ray will bend toward the normal upon travelling from air to glass, and will bend from the normal upon travelling from glass to air. As a result, the incident ray has been bent twice, once upon entering the glass, and once upon leaving the glass. Such bending of a ray of light is known as *refraction*.

To illustrate the principle of refraction, suppose we take a thick glass plate and lay it flat upon a table. Now let us look through it edgewise, and place two pins in the table on the far side of the glass as indicated in Figure 1. Having done this let us place two more pins on the near side of the glass in line with the refracted ray. Upon drawing a line around the edge of the glass plate, and removing the plate we notice that the incident ray deviated from its path upon passing through the glass.

Since light can be easily refracted, a prism, which is a triangular piece

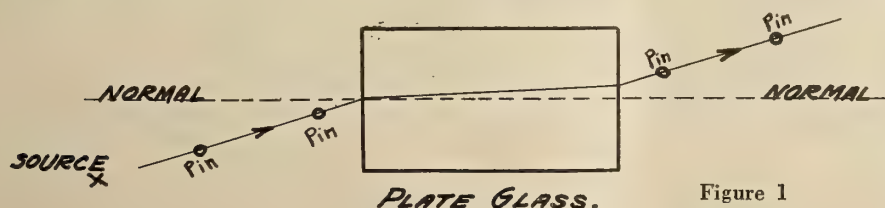


Figure 1

†Instructor of Physics, Stuyvesant High School, New York City.



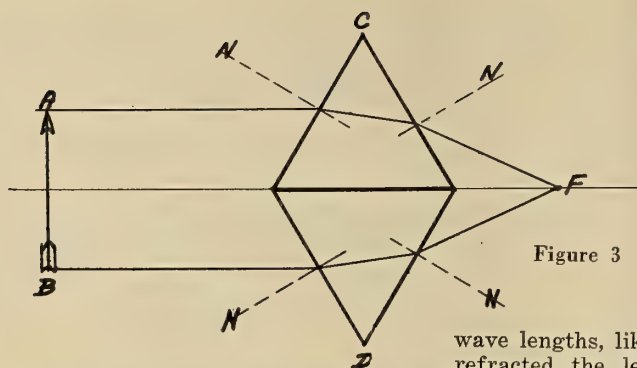


Figure 3

of glass, makes use of this principle in decomposing ordinary white light into its constituent colors. These colors make up the ordinary spectrum. Since the constituent colors of the white light have different wave lengths they are more or less refracted in accordance with their wave lengths, the short wave lengths being refracted the most, like the violet, and the long wave lengths being refracted the least, like the red. (Figure 2.)

Under these conditions let us see what would happen if we placed two prisms on top of each other. Let us pass a ray of light through each of these prisms as shown in Figure 3. A light source AB will proceed toward prisms C and D and upon striking their respective surfaces, will be refracted in accordance with the principle of refraction. In so doing the incident beam will be made to converge at F which is commonly called the *focus*. If we use our imaginations, we plainly see that these two triangular prisms, when cemented together, really constitute a crude form of double convex lens. Light from point A enters a more dense medium and bends toward the normal. Upon emerging to a less dense medium it bends from the normal and passes through point F. The same thing happens to a ray of light from point B. As a result we have a converging lens.

#### Chromatic Aberration

At this point it is well to consider that a lens, which is really made up of two prisms, will tend to disperse colors. In truth, this does happen, and experience has proven that the focus of this lens is not a single point, but rather a succession of points, the shorter wave lengths, like the violet, converging at a point nearest the lens than the longer

wave lengths, like the red, which are refracted the least and which converge the farthest from the lens. This defect of a lens is commonly called *chromatic aberration*.

Chromatic aberration is undesirable for most optical work, and so a means must be provided to eliminate this defect. This is usually done by taking two pieces of glass (usually crown and flint glass), whose dispersive powers are different. These are cemented together with Canada Balsam, so that light will pass from air to glass A then through glass B and into air again. (Figure 4.)

This will bring the incident beam to a sharp focus, the more refracted colors leaving A and entering B are again refracted to converge at the point F.

It has also been found that lenses



Figure 5

do not converge the incident beam to a sharp focus because of the mechanical construction of the lens. A ray of light entering a lens near its center does not experience much refraction, and is refracted only slightly in comparison with the ray which is refracted near the thinner portion of the lens. This is readily apparent from Figure 5.

#### Spherical Aberration

This defect is known as *spherical aberration*, which simply stated means, that the image does not converge to a sharp focus because of the physical relationship of the diameter of the lens to the length of its focus. This focal length is the distance measured from the optical center of the lens to the point of convergence, called the principal

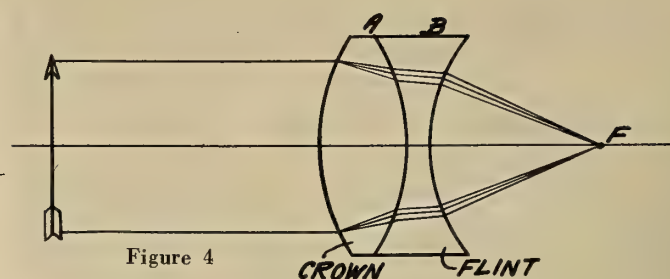


Figure 4

focus. A good remedy for this aberration is to place a diaphragm between the light source and the lens, so that light may be cut off at the edges, and only that light passing through the thicker portion of the lens will affect the screen.

Without being overly concerned at this time about the defects of the lens, let us assume that its chromatic and spherical aberration is so small as to be negligible. Let us follow a beam of light through a double convex lens, and see how the image is formed. Referring to Figure 6, let us draw a line from A through the optical center O. Then let us draw a horizontal line AC to the edge of the lens, and after refraction it passes through the principal focus F. If we trace two similar beams from B through O, and from BD through F, we find that an object AB placed a great distance from the lens comes to a focus at A'B'. Thus we have the rule for all lenses, namely:—draw a line from a point in the object through the optical center. Then draw a horizontal line to the lens, which, after refraction, passes through the principal focus. Do the same for another point on the object and the rays will cross at a point where we obtain for this convex lens an image which is real, and inverted. The relationship between the sizes of the object and image is proportional to their distances from the lens.

Let us now trace the paths of light from an object which is a great distance from a double concave lens. It should be noted here that a concave lens differs in one respect from a convex lens. A convex lens is thicker at the center than it is at the edges. A concave lens, however, may be looked upon as made up of two prisms with their apexes placed together, thereby giving the effect of a lens which is thin at the center and thick at the edges.

Knowing that light is refracted upon passing from air to glass, and from glass to air, we find that the rays diverge and do not come to a real focus on the other side of the lens, but if we follow our few simple rules, and draw one line through the optical center, and another horizontal to the lens which then goes through the focus F, we find an image appears on the same side of the lens as the object, and is called a virtual image. (Figure 7.) Its size and its po-

(Continued on page 16)

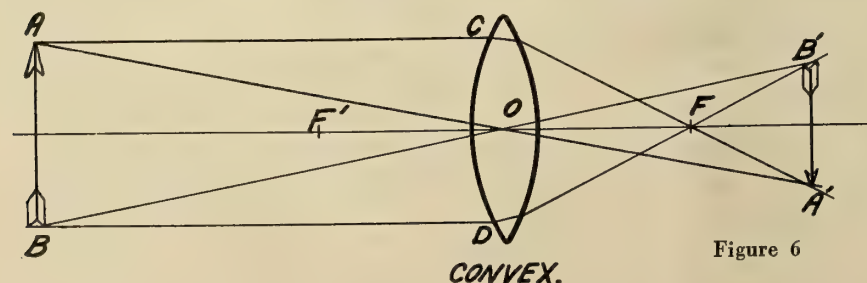


Figure 6



You wouldn't  
give them *pic-  
ture projection*  
like this . . . . .



. . . Then  
why give them  
*sound projec-  
tion* like this?

Your public that demanded good projection now insists upon clear, natural sound reproduction. Unless they get both in your theatre, you are giving them only a part of the show.

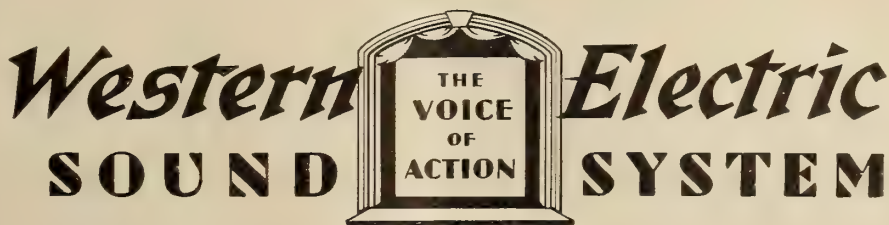
The recording of talkies by Western Electric apparatus—used exclusively by producers who make 8 out of every 10 pictures—has reached a high point of excellence.

It is now more important than ever that you use equipment capable of *reproducing* everything that directors and stars put into these productions.

Western Electric theatre equipment—designed and built as part of a complete system for recording and reproducing sound—served by ERPI to maintain quality—brings out everything that's in the picture.

That's why—week after week—the crowds flock to the nearly 7000 Western Electric equipped houses all over the world.

Only Western Electric equipment can give the complete show that brings maximum business to your theatre.



Northern Electric in Canada

Distributed by

***Electrical Research Products Inc.***

250 W. 57th Street, New York



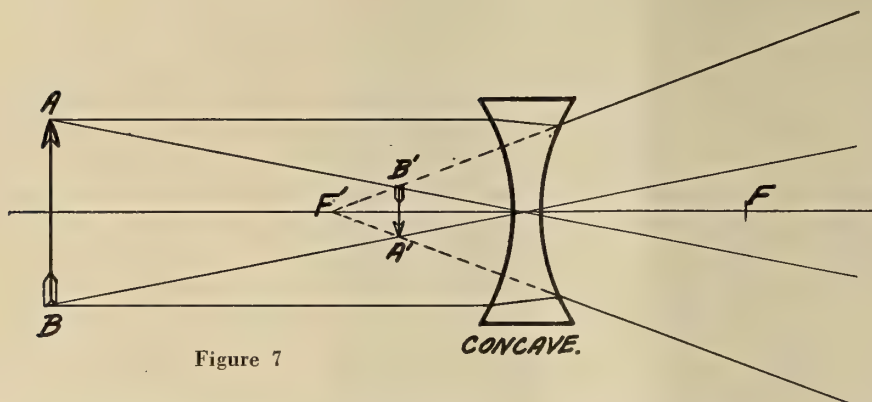


Figure 7

sition depends upon the size and position of the object. It is perfectly clear that if we move the object to or from the lens, the rays are going to converge or diverge more or less, depending upon the type of lens in consideration, and will be proportional to the distance of the object from the lens.

It is beyond the limits of this article to go into the various positions and sizes of object and image, but with these principles as a foundation, we shall see later on how we can use a formula to determine the location of object and image, their sizes, and whether or not they are real, virtual, inverted or erect. Bearing in mind

but one thing, that light is a wave motion which can be slowed down by passing through a medium of greater density, and that such slowing down manifests itself in the form of bending, and that such bending always goes toward the normal when passing into a more dense medium like glass, and from the normal in passing from glass to a less dense medium like air. With these fundamentals, a beam of light may be traced from its source through any system of lenses, and such a system may be simply computed in advance to determine the requirements for any optical system desired.

## Wide Film Standardization

### *A Summary of the Report of S.M.P.E. Committee*

**M**OST important among the activities of the recent Fall Meeting of the S. M. P. E. in New York City was the report of the committee on wide film standardization. This report embodied recommendations for future development in this phase of the motion picture art which are bound to have a far-reaching effect on the procedure finally adopted as standard. The present 35 mm. sound film print was characterized in the committee report as unsatisfactory from every angle, particularly with respect to its undesirable proportions. Even when these proportions were corrected to some degree by masking the height, the smaller area of picture remaining required a greater magnification of film to cover the same size screen.

#### Economic Considerations

Magnification has already approached dangerously close to the limit imposed by the graininess of the film, and this, coupled with the unsteadiness of the film in the projector precludes the possibility of securing satisfactory visual reproduction from 35 mm. film. It is significant to note that many substitute processes introduced within the past few months to obviate the necessity for wide film—such as Reelife, Magnafilm, etc.—were found by the committee to be lacking in sufficient worth to offer any means of solution to the problem.

The task of the wide film standardi-

zation committee was made doubly difficult for the reason that its deliberations were of a necessity concerned more with the economic aspects of introducing wide film than with the technical difficulties presented. Estimates of the cost of wide film to the industry range all the way from twenty to forty millions of dollars, with a majority of the better informed leaning toward the latter figure. And even these figures are not based on any serious cost analysis.

There are some who profess to believe that the introduction of wide film will aid sound reproduction to no little extent; but it has been pointed out a gain of only 6 db. would be obtained by doubling the area of the present sound track, and this gain would be in large measure offset by a corresponding increase in ground noise of 4 db., the resultant gain of 2 db. not being considered worthy of the trouble and expense involved in making the change.

#### Consider Intermediate Size

It is obvious, the committee report stated, that a practical recommendation must involve the ratio of screen width to screen height that is already established within reasonably narrow limits by both the proscenium arches and the balcony cut-off in existing theatres. The larger theatres, investigation showed, could use a ratio of width to height as high as

2 to 1, but the ratio for the smaller theatres is much less.

The committee stated that after careful consideration of all the factors involved it was of the opinion that the interests of all would best be served by the adoption of a 1.8 to 1 ratio of width to height. This recommendation agrees with the sentiment of a majority of the West Coast technicians who have conferred on the problem.

Careful consideration was given by the committee to the possibility of an intermediate film size, that is a standard somewhere between 35 mm. and 70 mm., the present two extremes. The committee is working on a layout that will permit the use of the 1.8 to 1 ratio and that will provide for a wider sound track and more suitable margins, and is attempting to assign dimensions to this film that will permit of the fullest use of the present 35 mm. equipment.

*Note: Of particular interest in connection with the foregoing summation of the S. M. P. E. standardization committee report is the reaction of the picture-going public to recent wide film presentations. The showing of "The Big Trail" on 70 mm. film in New York and on the West Coast, and the opening of "Billy the Kid," marking the bow of Realife (Loew process of a wide image from standard film), failed to measure up to advance expectations. In fact, these showings actually occasioned not a little unfavorable criticism; and it is understood that the producers have come to the conclusion to "storage" wide film for the present.—Editor.*

### W. E. vs. Kersten Radio Co.

In the first legal decision rendered on Patents 1,707,545 and 1,734,624, Judge Raymond of the U. S. District Court, Western District of Michigan Southern Division, sitting at Grand Rapids has ruled that these patents are valid and have been infringed upon.

The action was brought by the Western Electric Company, which is sustained by the legal decision, against the Kersten Radio Equipment Co., Inc., of Kalamazoo, Michigan. The patents cover the Western Electric loud speaker 555-W used for talking pictures and the diaphragm of this loud speaker respectively.

#### Cites Two Infringements

The decision derives additional significance from the fact that after Western Electric filed its suit in the fall of 1929, the Kersten Company offered for the consideration of the court another design of loud speaker modified in an attempt to avoid infringement. Judge Raymond's decision holds that both designs of Kersten's speakers are an infringement of the Western Electric Company's patents.



# Some Sound-on-Film Problems and Their Relation to Continuous Projection

By A. J. HOLMAN

**N**OT so long ago the advent of sound was heralded as the life-saver of the languishing motion picture industry, and the immediate popularity of the early synchronized sound pictures initiated a veritable stampede for sound equipment. In a very short time the handicaps and disadvantages of sound-on-disc became apparent in the practical working of the system and its inherent technical limitations were soon discovered in the research laboratories where work was being done to improve the tone quality.

For equal tone quality and fidelity, sound-on-film possessed so many evident advantages over sound-on-disc that the motion picture industry was satisfied to accept inferior pictures in order to have sound-on-film. The first and greatest compromise, which is still present, was the acceptance of an almost square picture in place of the old time-tried 3 by 4 picture which is best adapted for telling motion picture stories. In the early days of sound-on-film, the photographic quality, of prints was sacrificed to improve the sound track quality, but means have been found for eliminating this handicap.

Although the ultimate general adoption of sound-on-film and the gradual elimination of sound-on-disc is unquestionably a step in the right direction, nevertheless, the practical working of the sound-on-film system discloses many serious faults which were brought out most strikingly in open discussion at the recent S. M. P. E. meeting in New York. As a matter of fact, the practical difficulties are so grave that serious consideration is being given to using a separate sound track film which will run through a special sound reproducing mechanism operating in synchronism with the picture projector.

## Avoiding Dirt and Mutilation

This special sound track film would have the advantage of not being subjected to the usual oil, dirt, scratching and sprocket hole mutilation which are inseparable from intermittent projection, and it would not require waxing or other lubrication. Moreover, with the separate sound track film the old silent standard 3 by 4 picture area would be restored. Although the idea offers a solution to many of the practical problems now confronting the industry, after all, a separate sound track is a separate sound track whether it be on a film or on a disc, and such a system is certainly a step backward, re-intro-

ducing many of the disadvantages of the sound-on-disc system.

Considered in the light of the practical difficulties involved in sound-on-film presentations, continuous film movement (which I have always regarded as of secondary importance to continuous non-periodic screen illumination as an advantage of continuous projection), looms as of prime importance, offering a simple and complete solution to the industry's present problem. In view of the fact that the revolving lens wheel system of continuous projection not only provides the ideal screen illumination, as pointed out in my last article, but also eliminates intermittent film movement and all its inseparable ills which are particularly objectionable in association with a sound track, it must gradually become evident that continuous projection is a necessity and its general adoption is essential to the future development, growth and well-being of the motion picture industry.

To show how completely continuous projection solves the present problems of sound-on-film presentations it is only necessary to state what has been done with a continuously moving film.

## Troubles Minimized

In the first place, "green" prints, fresh from laboratory processing, are run without waxing or other lubrication because the light shoe pressure at the aperture plate and the con-

tinuous film movement overcome all tendency for the gelatine to seize on the runners. Secondly, the drag on the film, due to aperture shoe friction, which must be overcome by the middle sprocket, is never more than an ounce or two, hence the film is not distorted or torn at the perforations. Thirdly, because the aperture plate and guide shoes are curved, the film, in passing, cannot buckle and thereby contact with cross members above and below the aperture. Moreover, the lateral guides associated with the aperture prevent all side sway of the film as it travels across the aperture unit. Thus all probability of scratching the film or mutilating the perforation edges within the mechanism proper, are eliminated. This much desired result is so effectively accomplished in the revolving lens wheel projector that prints have been projected several thousand times without showing objectionable scratches or tearing or distortion at the perforation edges.

The presence of oil on a film is certain to cause dirt to collect on it, and if such a dirty film, while in motion, contacts with metal, the conditions are ideal for producing surface abrasions on the emulsion as well as on the celluloid. It is evident, therefore, that the more tendency there is for a projector to throw oil on the film, the more certain is the film to become scratched. Here again the continuous projector has a decided advantage, for it has no intermittent movement and no oil-filled case immediately adjacent the film position. For this reason prints may be run through a continuous projector several thousand times without collecting oil, dirt, and the customary scratches.

## Better Sound Track Possible

As far as the sound track is concerned, it is no more subject to surface damage or sprocket hole mutilation in a continuous projector than it would be if it were on a separate film and run through a special sound reproducer, hence, in this respect continuous projection offers all the advantages of a separate film. But what is far more important, the old standard silent 3 by 4 picture area and an extra wide sound track are available on the standard 35 mm. film because it is entirely practical to propel the film through a continuous projector mechanism by means of sprockets designed to engage in perforations along one edge of the film only, thus making available additional photographic area for the sound track. In a continuous projector this does not violate good

## L. U. Inspection Service

A regular inspection service has been inaugurated by Local Union 306 of New York City for those theatres which are manned by union men. A staff of specially trained projectionists and sound engineers will be maintained by the Local Union, and they will regularly visit every unionized theatre in Greater New York and check up on every phase of projection and sound reproduction.

Special attention will be paid by the inspectors to those features of the equipment which are considered to be conducive to fires in the projection room. In addition, it will be ascertained if the work of the projection crew is satisfactory in every respect, and whether the equipment provided by the theatre is in such condition as to permit the best possible work by the crew.

The service will be free.



engineering practice because the film is subjected only to a constant and very slight tension in passing through the mechanism. On the other hand, it is impractical to operate with such a film in an intermittent mechanism because of the sudden initial heavy pull which must be applied to the film periodically to cause it to "break from rest" when the shoe spring tension is just sufficient to prevent "over shooting" as the film periodically comes to rest.

From the foregoing it is apparent that continuous projection offers all the advantages of the separate sound track film without sacrificing the convenience and simplicity of the present sound-on-film system. Surely this is another substantial and sound reason why continuous projection can best solve the industry's present sound presentation problem and thus add to the attractiveness and saleability of its product.

#### Screen Considerations

The necessity for porous screens for sound picture presentations has introduced another factor which is more apparent than it used to be and which detracts considerably from the beauty of the screen image, especially in theatres where the magnification is great. I refer to the pronounced increase of graininess which, for a given magnification ratio, is intensified by an increase in the unit area screen brilliancy.

Since porous screens have less reflecting surface within a given area, due to the presence of numerous holes, it follows that the average screen

brightness of the non-porous screen can be obtained only with a porous screen by increasing the light intensity, hence the graininess becomes more pronounced. As a matter of fact, the graininess would not be so objectionable were it not for the fact that the grain positions vary from frame to frame and, when the frames are projected intermittently and, therefore, individually, there results a constant shifting of the grain images which produces a movement or "boiling" effect over the granulated areas, thus exaggerating the graininess effect.

Because of the varying positions occupied by the silver grains from frame to frame, and because of the long smooth dissolving transition, which is characteristic of the revolving lens wheel projector, it is evident that the graininess of a film frame will be largely neutralized by the graininess of the adjacent frames through the dissolving action which takes place between film frames, thus subduing the graininess effect instead of exaggerating it.

The almost complete absence of graininess in the continuously projected image has been taken by some as an indication that the definition was poor, whereas this important inherent advantage of continuous projection results entirely from the above described conditions. The fact that outlines are sharp is sufficient evidence that there is nothing wrong with the definition. Thus continuous projection eliminates excessive graininess and permits larger screen images from standard 35 mm. film.

## Some Facts on Carbon Jaws

By M. H. Goldberg†

THE old days are gone, and with them the projector crank, silent movies, and opaque screens. With the solid reflecting surface of the opaque screen discarded, the perforated sound screen has ushered in the period of a brighter light source to counteract the loss of light both at the source (photography), and at the screen (reproduction). High intensity and high intensity reflector arcs of many makes provide this brighter light source with a few attendant practical problems which have been solved—in the laboratory. In actual practice, however, we find these problems still cropping up. Solutions for these problems have not yet been found.

We are faced first with the problem of increased heat-warping film which, with that warping, becomes a spectre of in-and-out-of-focus projected on the screen. While rear shutters on every projector would ideally solve the difficulty of warped film, the low percentage of rear shutters in use at present cancels their advantage in theatres projecting film already run

through mechanisms without the benefits of the heat reduction of the rear shutters.

There is yet another difficulty which happily has been solved both in experimental laboratory tests and in practice. This difficulty encountered in the operation of all types of high intensity lamps has remained so long without solution for various reasons, but although the means employed seemed simple and practical in tests, they proved unattainable in practice.

#### The All-Important Problem

Here we are, rotating a carbon, feeding it forward, horizontally during rotation, delivering current to that carbon (all while the carbon is being heated so that it might perform its work), to produce light. Excessively high heat intensity is required—a temperature which will melt every metal known at the crater of the arc. Luckily we have to do with carbon clamping, rotation, and feeding an inch or so back of its hottest point. The small difference in temperature allows the use of one or several metals. However, the metal to be

used must resist the intense heat and the several gases formed by oxidation of the carbon, must be a good current conductor, and must be mechanically sound for maintaining alignment.

Very few metals will serve for all these requirements. While one may withstand the attack of the gases formed, and be a good current conductor under ideal conditions, the intense heat will break it down. The metals now in use are suitable for the job under ideal conditions but not wholly under normal operating conditions. Although we find that brass, nickel and allied alloys may be good current conductors and withstand the attacks of the gases, they are neither of these unless the surface within the contacting area of the carbon is entirely free of other matter and bright with only the metal of which it is formed.

To keep the carbon jaw in this condition requires constant polishing and cleaning of the contact surface. Unless the jaw is cleansed at least one every ten hours running time, harmful effects become apparent. Poor contact between carbon and jaw soon begets "arcing" between these two points. This arcing is of high enough temperature to melt and break down the surface of the metal. The whole jaw soon overheats, the carbon is "frozen" in the jaw, and it cannot rotate or feed forward. The jaw is ruined unless milled down to a clean contact surface.

#### Perfect Contact Impossible

Even with constant daily polishing, the impossibility of maintaining a perfect contact at all points of the contact surface is evident. If a point instead of surface contact is obtained, overheating and melting soon occur. Some metals will not break down under intense heat, but an oxide formed on the surface soon increases the resistance to passage of the current. The constant cleaning will in a very short time reduce the jaw below its proper size, so that center distances are changed with an attending change of relation with the negative carbon.

It is clearly evident, then, that the cost of replacement very quickly mounts into a considerable sum, quite aside from the trouble caused. Poor light, breakdown of light, fluttering due to non-rotation, mottled field of light, etc., are some of the resultant difficulties.

#### A New Contact Metal

In order to cut the cost of replacements, the thought occurs to insert other rare metals able to withstand all these conditions. Here, however, another condition enters: Oxidation between metal surfaces soon causes the same condition as oxidation between carbon and metal. The breakdown which follows ruins both the jaw and insert. That has been proven in practice.

There is, then only one solution. To find the metal which will not burn out

†GoldE Manufacturing Co.



or corrode; which does not need constant cleaning; which will not hold back the rotation of the carbon and proper feeding, and which will deliver the full current delivered to it from the source of supply. There is such a metal. As it had never before been used for the purposes of carbon jaws and as its manufacture is restricted to only two concerns in this country and one in Germany, the use of it in return for the research and application has been awarded for use as contact surface in carbon jaws to the GoldE Manufacturing Company, Chicago, Ill., exclusively. They claim for it an extremely long life without the common trouble so usually encountered in carbon jaws.

A very broad guarantee, which tends to protect the theatre owner

against cost of replacement in six months' use and a further endorsement as to lasting qualities for at least one year would seem to make this use of the GoldE Carbon Jaw an exceptionally good investment, particularly in view of the makeshift inserts. The metal used is comparatively costly. The method of its use in the GoldE Carbon Jaw allows of the use of sufficient quantity so placed as to afford wearing surface for the life of the entire jaw.

With each pair of GoldE Carbon Jaws, the GoldE Company are furnishing one GoldE Carbon Jaw Lap which if used to polish the jaws once every week or two, will prolong the life of the jaws beyond the year of service claimed for them, in some cases for almost two years.

half-wave rectifier which uses a second 205-D vacuum tube.

Ordinarily these amplifiers require no attention except as it may become necessary to replace the vacuum tubes should they burn out. The amplifiers are interchangeable, and each can supply from one to thirty telephone headsets.

#### One Mounting Every Second Seat

Under the arm of the theatre seat is mounted the jack box which contains two jacks in parallel and is intended to serve two patrons sitting side by side. Therefore, one mounting unit is placed on every second seat.

The telephone head set used with this system consists of a high impedance receiver with a single wire head band suitably padded. A small cylindrical potentiometer which has seven steps and an "off" position and closely resembles a fountain-pen in shape and size, is provided for volume regulation to suit the needs of the individual.

The projectionist is provided with a headset which may be connected to the hard-of-hearing system for determining whether the system is functioning. When the patron wishes to use the set the receiver is held to his ear by means of the head band and the volume is adjusted by the potentiometer as required.

#### Other Uses for Sets

When public address facilities for reinforcement of stage presentations are available, the hard-of-hearing sets make possible the enjoyment of this feature of the program as well as the sound pictures.

Hard-of-hearing sets can also be adapted to amplifying stage programs for hard-of-hearing patrons where there is no sound picture system installed.

## W. E. Hard-of-Hearing Sets

### A Brief Explanation of the Equipment and Hook-up

IN order to permit the hard of hearing theatre patron to enjoy the talkies with the same degree of satisfaction as his more fortunate neighbor, "hard-of-hearing sets" have been installed in many theatres.

Briefly, this set comprises the following apparatus: a resistance network which taps off a small amount of energy from the main sound picture system; an amplifier which raises this energy to the proper level; a series of jack boxes installed on the theatre seats and containing jacks wired to the output of the amplifier; and telephone headsets, each including a receiver, volume control, and cord terminated in a plug which is inserted into the jack on the seat to connect the headset to the amplifier output.

#### Three Forms Available

The network referred to above is made up in three forms to adapt it to all types of theatre sound systems. When the Western Electric 40-type amplifiers are used in the theatre sound system proper, this network is inserted between the 42-and the 43-type amplifiers. An important feature of this design is that by connecting the attachment in series any trouble in these sets is prevented from affecting the sound reproduction in the theatre. It will be obvious that any volume changes made by the fader in the projection room, will cause a change of sound in the headsets as well as in the theatre.

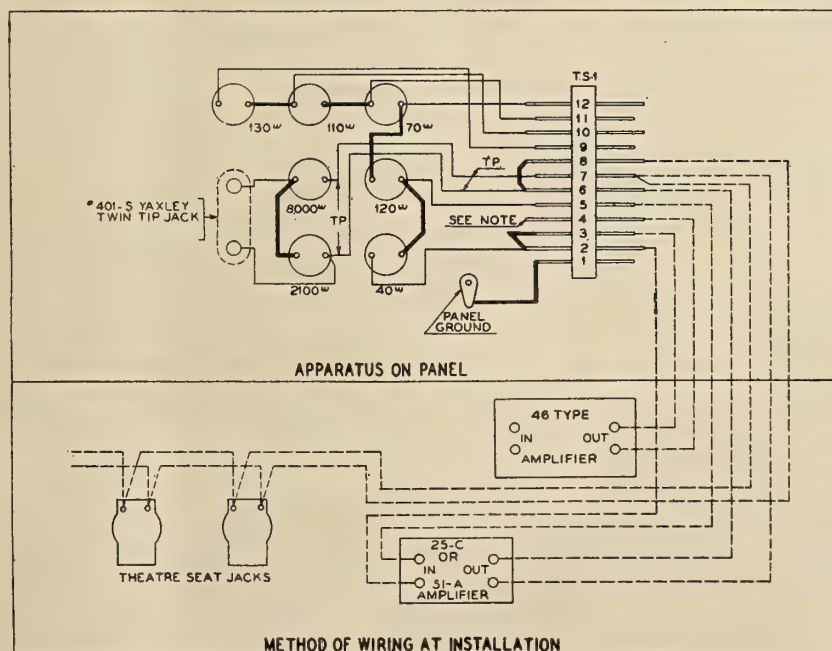
There are two kinds of amplifiers at present available for hard-of-hearing installations. Both are wholly A. C. operated and electrically are identical, the only difference being in the mechanical construction. The 25-C type is contained in an octagonal shaped metal box. Attached to the amplifier is a flexible cord provided with a switch, for the purpose of making connection to the power supply. Terminals are provided on

the bottom of the base for making input, output and ground connections. The amplifier is intended to stand in an upright position.

The other amplifier, the 51-A type, is contained in a square metal box with a handle on the top. A flexible cord provided with a switch is used for the purpose of making connections to the power supply. A terminal strip located beneath the top cover serves for making input, output and ground connections. The amplifier is intended to rest on a flat surface without fastening.

#### Accommodate 30 Headsets

Both of these are one-stage amplifiers making use of a 205-D vacuum tube. The filament of this tube is supplied with alternating current from a transformer connected to the 110-volt A. C. source. The amplifier plate current is obtained from a



Wiring diagram of W. E. 702-A apparatus for deaf sets



# What Is the Multicolor Process?

By HOWARD B. LEWIS

**M**ULTICOLOR is a two-color subtractive process for the production of colored motion pictures, using the bi-pack method of photography, double printing onto double-emulsion positive stock, and selective coloring of the two images by a combination of metallic toning and dyeing.

Such a statement would not be out of place in a dictionary or encyclopaedia and perhaps would carry the whole story to a person actively engaged in colored motion picture work, but for the average reader it will certainly require elaboration and explanation.

We are all familiar with the fact that the endless variety of shades of color can be quite accurately produced by the combination in different proportions of a relatively small number of so-called primary colors. Practical printing and lithographic processes commonly use four colors, although more have been used for extremely realistic reproduction. Three colors are enough to reproduce very faithfully all ordinary shades.

In the moving picture field, owing perhaps to the better blending of the transparent colors used in the film, three colors may be said to give virtually perfect results and two colors to give very satisfactory rendition of most shades. It is extremely difficult to believe that the combination of a red-orange image with a blue-green image could satisfactorily reproduce flesh tints, the bloom of the peach, or the myriad colors of a ballroom and its gaily dressed throng. But screen results proved that, while not absolutely perfect, this reproduction is exceedingly faithful.

## The Photographic Process

The first step in any photographic process is the making of the exposure in the camera or its equivalent. In black and white photography a single negative film is used, which consists of a transparent celluloid base, or supporting means, and an emulsion consisting of gelatine in which a silver salt is embedded. This silver salt has peculiar properties which cause it to respond to light in such a way that after exposure to light it may be chemically treated and the grains which were light struck will be reduced to metallic silver.

This metallic silver is in a very finely divided form, and like any finely divided metal, appears black and opaque. If the light striking the emulsion is strong, it will affect all of the grains of silver where it strikes, and that portion of the image will be developed to complete black-

ness. If the light is weak, only part of the grains will be affected and a gray image will result. In taking a photograph of ordinary objects, a wide variation of light intensity will be found over the surface of the picture, resulting in various shades of gray and black.

## "Orthochromatic" Negative

So far no one has succeeded in developing a photographic emulsion which will develop to reproduce the original colors of the object photographed. The different colors of light, even though of the same intensity, will not all affect the emulsion equally, but the resulting image in every case will simply consist of grays.

Orthochromatic negative, the negative commonly used by amateurs, gets its name from the Greek words meaning "right color," indicating that this negative is intended to reproduce a colored scene in black and white so that the result will be realistic. It is common knowledge that red ordinarily photographs black, and that the amateur can use a red light in his dark room when developing negative. This emphasizes the fact that orthochromatic negative is not sensitive to red light. This lack of red sensitivity is a severe handicap under artificial light, particularly incandescent lights, which furnish most of their illumination in the red part of the spectrum.

Panchromatic negative has become

# The Value Of Rehearsals

By H. M. Wilcox

*Operating Manager, Electrical Research Products, Inc.*

**A**N experienced theatre manager usually insists that the vaudeville billed to appear in his theatre be thoroughly rehearsed before the opening performance. The same manager will, however, start a sound picture program without rehearsals. Why? Rehearsals are neglected for one of two reasons: either the films do not arrive at the theatre in time, or there is some reluctance to incur the expense involved. Fortunately film distributors make every effort to make prompt deliveries and only infrequently are films received in first run houses too late for rehearsals. Probably the most common reason for the neglect of rehearsals is the matter of expense.

Whatever the reason, it is hardly fair to theatre patrons to ask them to sit through a performance that is really a rehearsal.

## Why Rehearsals Are Necessary

The most experienced projectionist cannot be expected to put on a good show when using the film for the first time. With sound on disc, cases of "out of synchronism" sometimes occur due to incorrect patching of the film. An incorrectly patched break in the film when it was last used will cause the picture and sound to be out of synchronism. Also if the patch is insecurely made it may pull open and cause a break in the show.

The amount of "leader" on the different reels is an unknown quantity and can best be checked by a rehearsal. Should the leader be too short or too long the changeovers will

be poor, resulting in breaks in the continuity and disconcerting pitch changes or both.

Many people openly express their dislike for "first nights." A check of audience reaction will probably show many more who may not directly associate a poor show with the fact that it is the first time the picture has been shown. They do, nevertheless, express dissatisfaction and come away with a feeling that they have not gotten "value received." Wrong sound volume, incorrect changeovers resulting in poor continuity or pitch changes, oil spots on picture, noise due to poor splices and picture and sound out of step—all of these can be prevented by careful rehearsing. And in these days of rapid transportation, patrons do not hesitate to drive a little further to another theatre if they feel they will see a better show. You may say such things have little effect compared to the popularity of the pictures, but with reasonable care in rehearsals they can be prevented.

For the house with frequent changes in program, the problem of adequate rehearsals becomes more difficult, but even in such cases rehearsals are desirable. At least the first show with the new picture, even with an audience in the house, should be considered as a rehearsal, the manager making it a point of being present, giving his personal attention and supervision. A smoother running of shows resulting from a careful rehearsal cannot help being reflected in box office receipts.



very popular in recent years due to the fact that, as its name implies, it is sensitive to all colors; but it still develops to a black and white image.

In a process of color photography which is to make use of the known properties of photographic emulsion, it becomes necessary to separate the different colors in the object to be photographed and record them on different negatives. Various methods of accomplishing this have been used, and several of them are so obvious that they will occur to the reader immediately. For instance, an ordinary camera may be used with panchromatic negative, and a revolving filter wheel placed in front of the lens so that alternate frames will be photographed through red and blue segments of the filter.

Again, the beam of light coming through the lens may be split by means of a prism or an unsilvered mirror, and the two parts of the beam be recorded on two different frames of the same negative strip after passing through red and blue filters.

The Multicolor bi-pack method employs two negatives, placed emulsion to emulsion or face to face. The emulsion nearer the lens is of the orthochromatic or non-red sensitive type. On its surface, thus lying between the two emulsions, is a filter layer which allows the red components to pass through, but absorbs the blue components. The black negative is of the panchromatic or red sensitive type. Thus the front negative records the blue light values, and the back negative the red values.

It is very important that the two negatives be held in close contact during exposure as the photographic image formed by the lens is sharp in only one plane, and it is necessary to have the two emulsions lying as closely as possible in that plane. It is also necessary that some means be provided for accurately superposing these two images for printing later in the process. To ensure that the images can be accurately superposed later, a closely fitting pin is inserted in one perforation during the exposure in the camera. At any future time such a pin may be inserted in the same hole and the images will again be in register.

After exposure the two negatives are developed as in black and white photography, and the filter layer originally on the orthochromatic negative is washed off. After drying, the negatives are printed simultaneously onto opposite sides of a third strip of film which carries an emulsion on each side of a celluloid base. These two images are then developed into a black and white positive image, positive meaning that the whites of the original scene now appear white, and the blacks, black, instead of the reverse, as was the case on the negative.

The next step is to apply the colors to the two images so that the

image which records the blues will be colored blue and that recording the reds will be colored red. The first step in coloring consists in converting the black silver salt to a salt of another metal which is blue. This conversion takes places grain by grain, so that the definition of the blue image is just as sharp as that of the black and white image. It is obvious that the chemical bath which converts the blue image would also convert the red image if allowed to come in contact with that image.

It is therefore necessary to apply the blue solution to the blue image only. This may be accomplished by floating the film over a tank of blue solution, or by rubbing the film over felt pads saturated with the solution, or by spraying the solution on one side of the film.

After the blue image is completely converted it is possible to immerse the film in a bath which converts the metallic silver on the opposite side to another metallic salt which will absorb a dye. The film then goes into the dye bath which colors the grains which have replaced the silver in the red image. This image again is a replacement, grain for grain, of the black and white image, and the dye is of such nature that it does not attack the gelatine or the celluloid, so

that the resultant image is still sharp.

Multicolor is called a subtractive process, because its two superposed images absorb from the beam of white light from the projection lamp red and blue light in proportion to their respective densities, thus subtracting from the beam the components not desired on the screen.

#### No Adequate Additive Process

Many attempts have been made to make a practical additive process in which a red image and a blue image would be simultaneously projected from different films or different frames of the same film, combining on the screen to reproduce the original colors, but all such processes have serious faults or require expensive alterations to the projection equipment which render them not commercially practicable.

The factors which are making Multicolor interesting to theatrical and industrial producers alike, are its extreme simplicity from the cameraman's and producer's angle, its very sharp definition and accurate color rendition, and its convenience for use in standard projection equipment. The use of Multicolor entails no extra expense except in the laboratory, and efficient production methods are rapidly lowering this cost.

### Principal Requirements of a Projection Lens

BY F. H. KOLLMORGEN

A PROJECTION lens has for its function the magnification of a small object (the film image), into a picture of large size. The magnification being considerable, often more than 200 times, requires that the lens should be made with a precision akin to that of a microscope objective in order to show the image in all its fine details without blurring. It would go too far here to enumerate the many optical troubles which have to be carefully corrected by mathematical computation in the design of the lens, and guarded against during manufacture. Suffice it to say that the finished lens must throw a picture on the screen which has the following characteristics:

**Contrast:** All white parts of the picture must be pure white, not yellow or grayish, and all black must be thoroughly deep black without haze or fog.

**Definition:** Even the finest details of the film must be reproduced without the slightest blurring, particularly so near the center of the picture. A very slight falling off in the definition towards the edge of the field is unavoidable, particularly when large pictures are produced with a short throw, but even under these conditions this should not be sufficient to obliterate detail.

**Color Correction:** At no part of the picture should there be any red or

green edges visible, as these indicate fault in mathematical design.

**Aperture:** The lens should have a sufficiently large clear aperture to permit free passage to the maximum of light obtainable.

#### "Bubbles" in a Lens

Why is optical glass never free from bubbles? Because it must be entirely homogeneous, that is, of the same density and optical qualities throughout, in order to give a perfect lens. This result can be obtained only by constant stirring of the molten glass until it hardens. This stirring keeps small gas or air bubbles in the glass. If the stirring were discontinued and the bubbles allowed to rise to the surface, the heavier materials composing the glass mixture would sink to the bottom and the glass would not be suitable for first-class lenses. No such requirements prevail in ordinary plate glass.

#### Occasion Negligible Damage

That is the reason why use is made of expensive glass with bubbles, rather than cheap glass without bubbles in projection lenses. The image on the screen is of far greater importance than the appearance of the lens itself.

What damage do bubbles cause? They absorb as much light in proportion as their size is to the clear size of the lens. In the worst case this does not amount to more than one-twentieth of one per cent. The damage is therefore entirely negligible.

Bubbles in the glass prove that it is real high grade optical glass.



# Operation of Projection Arcs from Motor Generator Sets\*

By C. C. DASH

WHEN series arc generators were introduced and used successfully in theatres, the projection requirements were relatively simple. The projection room equipment usually consisted of two projectors with vertical carbon lamps with the addition in some instances of a spot lamp requiring the same amount of current as the projectors. Arc controls first introduced and used were mostly of the intermittent type using a voltage relay, the coil of which is connected across the arc, in connection with an operating motor. The operation of these lamps was successful with the series arc generators, and as no ballast resistance was used in the projection arc circuit a maximum converting efficiency from alternating current supply to direct current for the lamps was obtained.

With the changes that have occurred in the projection requirements, theatres have been attempting to use existing generating equipment with results that are not satisfactory.

If a theatre has a 75- or a 70-ampere series type generator set, it might be assumed that the generator will satisfactorily furnish 70 amperes to a reflector high intensity lamp. Experience has shown that this assumption is not correct.

Fig. 1 shows a typical volt-ampere performance curve of a 75-ampere series arc generator. Curve A is the performance with full field and curve B with the field regulator set for 70-ampere output at 60 volts. When you follow curve B up to 120 volts you

will find that 73 amperes are obtained. The variation of current between these two points is not a straight line, but has considerable curvature.

The positive carbon of the high intensity lamp rotates and a continuous arc feed is customary. This condition combined with the volt-ampere characteristic in the region of the 60-volt point makes the arc unstable, resulting in poor light performance unless the projectionist is constantly regulating the arc control.

If the projectionist strikes the arc and sets the arc length so that he obtains 60 volts across the arc, and the arc control is set so that the carbon feed exactly equals the rate of carbon consumption, the operation will be perfectly satisfactory; but if the arc feed is a trifle fast, the arc length is decreased, which lowers the current and thus decreases the carbon consumption, making the shortening of the arc cumulative, resulting in a very poor light and necessitating light adjustment in a relatively short time. Conversely, if the carbon feed is slower than the rate of carbon consumption, the arc length, and consequently the voltage across the arc, increases. This results in an increased current which increases the carbon consumption so that this effect is also cumulative, and a long arc will result.

If the positive carbon starts to burn off eccentrically, a serious pulsation of current will result with each revolution of the carbon. This effect is also cumulative, as the current is increased at the time when the arc is longest. It can be seen, therefore, that a series arc generator cannot be

expected to give satisfactory results on high intensity lamps with a continuous arc feed, even though an attempt is made to use ballast resistance in series with the lamp.

There have been attempts made to operate the low current reflector lamps with continuous arc feeds, and the same conditions obtain as with the high intensity lamp, except that the difficulties caused by the rotating carbon are not encountered.

An electric arc is unstable when connected to a source of constant voltage without a ballast resistance in series with it. The generator voltage or supply voltage for stable arc operation will be in excess of the arc voltage by the amount of voltage drop in the ballast resistor. For satisfactory operation this ballast resistance voltage drop should be not less than 50 per cent of the arc voltage, and for economical reasons should be not much over this value.

The combination of the ballast rheostat and an electric arc in series connected to a constant voltage d.c. source is a simple electrical engineering problem, but as the conditions vary it becomes rather obscure to one not familiar with the problem.

An electric arc supplied with direct current cannot be figured as a rheostat on account of the fact that the resistance of the arc is a variable quantity. Carbon has a negative temperature coefficient of resistance, and the arc stream apparently has the same characteristic. This characteristic of the arc is shown in the low current reflector arc which, when adjusted for a constant arc length, has

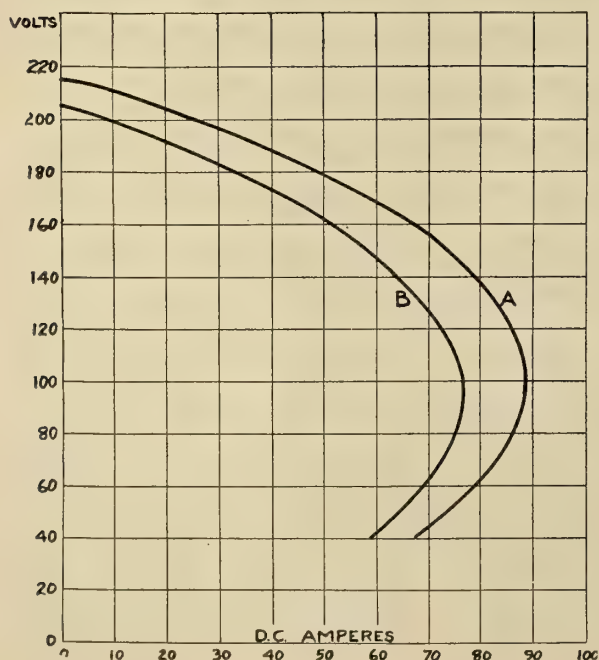
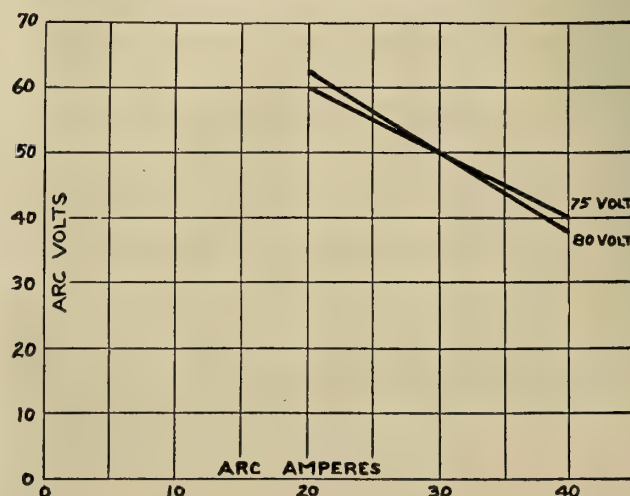


Fig. 1. (At left.) Typical performance curve of 75-ampere series arc generator

Fig. 2. (Below.) Variation of current and voltage with 75- and 80-volt generators feeding a low current reflector arc set for a 50-volt arc at 30 amperes



\* Journal of the S.M.P.E., Nov., 1930.



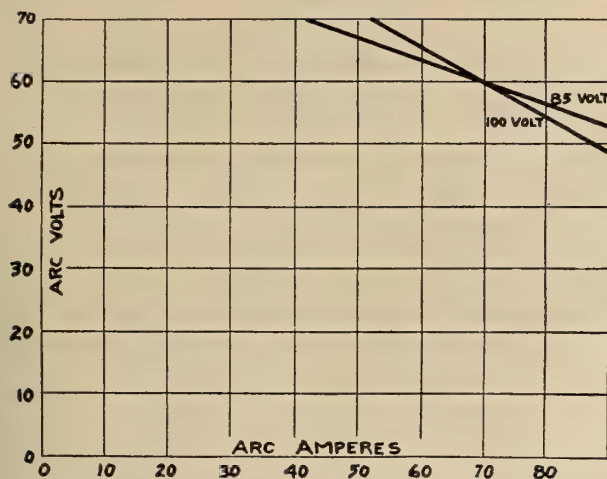


Fig. 3. Variation of current and voltage with 85- and 100-volt generators feeding a high intensity arc set for a 60-volt arc at 70 amperes

an arc voltage which is practically constant, although the current may vary within the limits for which the carbon is designed.

If we assume a certain size carbon which is rated to operate from 25 to 30 amperes with a definite arc length corresponding to an arc voltage of 50 volts, at 25 amperes the apparent resistance is 2 ohms; and at 30 amperes, it is 1.67 ohms. If we take a piece of ordinary resistance material and change the current from 25 to 30 amperes, the voltage will vary directly as the current changes.

On account of this constant voltage condition we find that the variation of current in an arc with change of arc voltage caused by a change in arc length is much greater with a small difference between arc voltage and supply voltage than with a larger difference between arc voltage and supply voltage.

Fig. 2 shows this variation with a low current reflector type arc used with a 75-volt generator and an 80-volt generator, the basic adjustment in this case being for a 30 ampere arc with a 50-volt arc length. While the difference between the slopes of these two curves is not very marked, there is a big difference in the ease of operation and the resulting changes in current through the lamp with slight changes of arc length.

Fig. 3 shows the variation of arc current with change of arc voltage with a high intensity reflector lamp which is set for a 60-volt arc at 70 amperes. The change in current with the 100-volt source is much less than with the 85-volt source.

Fig. 4 shows the variation in current with variation in arc volts for a high intensity lamp adjusted for 125 amperes at 70 volts using an 85-volt generator and a 100-volt generator. Experience has shown that 85-volt generators are not desirable for high intensity lamps with an arc voltage of 70 volts because the change in current is greater with slight changes in arc voltage.

The rheostats used in connection

with the projection arcs must be designed to give the proper voltage drop at the current required. With the variation of current which comes with a small change in arc voltage it is very easy to overload these rheostats. Assume a low current reflector arc nominally operated at 55 volts at the arc, normal current 30 amperes from an 80-volt generator. The voltage drop across the rheostat will be 25 volts. With a variation of arc voltage the following rheostat loads would be obtained:

With an arc voltage of 55, and an arc current of 30 amperes, the rheostat will be operating at 100 per cent load. If this arc voltage is reduced to 45 volts with the same generator voltage and same amount of resistance in the rheostat, the arc current will increase to 42 amperes and the load on the rheostat will be 196 per cent of normal.

There is a great deal of variation in the practice of projectionists throughout the country with respect to arc voltage, and the proper operating conditions with motor generator sets or any source of direct current power can be obtained only when all of the equipment, rheostats, arc controls, carbons, and direct current supply are properly matched.

One other item which should be considered is the proper connections when two constant voltage generators are installed in a theatre. The natural way for an electrical engineer to connect these generators would be for parallel operation. When two generators of similar characteristics are connected in parallel they will operate satisfactorily and divide their load properly only when the induced voltage in the two machines is the same and the resistance of the armature circuit together with the interpole and series fields is inversely proportional to their capacity. Under conditions of operation where two machines would be started about the same time, there would probably not be much difficulty in obtaining a balanced load on the two sets; but

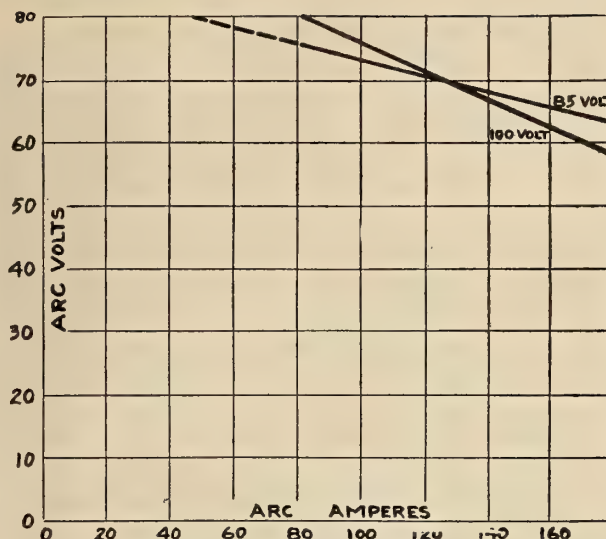


Fig. 4. Variation of current and voltage with 85- and 100-volt generators feeding a high intensity arc set for 70 volts at 125 amperes

with conditions as they exist in the theatre where one lamp is operating for a period of from 25 to 30 minutes, making the load on the generator equipment light, it is not economical to be running the two machines.

Under conditions as they obtain we find that when the heavy load comes on, the projectionist will start the second machine with cold windings and parallel it with the first, which has been running probably long enough to have come to a stable temperature. He will adjust the generated voltage of the two machines so that a proper division of the load is obtained. In a short time the shunt field winding of the two machines will have warmed up enough to reduce the generated voltage in the second machine to the point where the loads are no longer equally divided. As a matter of fact, unless the generator has very close voltage regulation and very little change of voltage with change in temperature, it may drop its load almost entirely, imposing the load on the machine which has been running the longer time. The necessity of frequent adjustment during the period of heavy load when the projectionist has the most equipment to look after, results in attempting to make him a switchboard operator as well as projectionist.

It has been found that by far the most suitable way to connect generators when there are two installed in a theater is to connect each generator to a separate bus and provide each projection lamp with a separate double pole switch so that any lamp can be connected to either generator as required. This connection gives all of the advantages of the parallel connection inasmuch as in the event of an emergency the equipment can be connected to either set, and when both generators are required to take care of the peak load each generator will supply its lamps without the continued attention of the projectionist.



# As The EDITOR Sees IT

## T ¶ *Coordinating Technical Activities*

THE recent S. M. P. E. meeting in New York (a brief resume of which is offered elsewhere in this issue), failed to bring agreement on a number of technical problems now confronting the industry. It was not to be expected, of course, that all that was necessary to put the industry on an even keel in all matters technical was for the Society to meet, deliberate on the matters at hand, and then proceed to announce its conclusions to a palpitating industry. But it was expected, for example, that wide film standards would be agreed upon, that color in motion pictures would receive a new—and, may we say, a badly needed—impetus, and that the situation with regard to sound would be further clarified. But the meeting was singularly unproductive of such results. This is said not in any critical vein but merely as a statement of fact. The S. M. P. E. with a fine record of accomplishment behind it needs no apologists.

Taking a broad view of the industry as a whole, we are impelled to express our honest opinion that the present machinery for the coordination and dissemination of information on technical activities is badly in need of an overhauling. Speed is, or should be, the primary consideration in the broadcasting of technical information, so that as many workers within a given field become aware of new developments as soon as possible. But the various branches of the motion picture industry are altogether too self-centered to make possible any such coordination. The general attitude seems to be that of every man for himself and the devil take the hindmost, the hindmost in most cases being the workers in the field who are finding it increasingly difficult to secure the proper cooperation necessary to an intelligent execution of their duties.

The matter is not so simple as to have the answer supplied by one or even one hundred editorials, but if a plain statement of fact in connection with the problem will prove beneficial in provoking some thought on the matter, it will not have failed of its purpose.

## T ¶ *Extending a Union's Usefulness*

THE establishment by Local Union 306 of New York City, of an inspection service for the theatres manned by its members is a step in the right direction. We have always maintained that a Local Union should be equally interested in the *quality* of the work done by its members as it is in the *quantity*, and that the matter of hours, shifts, number of men and pay, while in the very nature of things of primary importance, should not be the only consideration. We have always adhered to this viewpoint; although we must admit that when we first expounded these thoughts a little more than a year ago, we were considered a bit radical.

Just what does this inspection service mean? It means that Local Union 306 will send out 14 field men who will constantly check a theatre's equipment with a view to determining whether the Local man on the job is able to give the kind of a show for which he is paid and which the Local demands from him. Obviously it is impossible for even the very best men to give a good show if they are handicapped by defective equipment. These field men, then, will check the equipment and then in turn check the quality of work against the equipment. Defects in either equipment or workmanship will be noted and will bring action by the Local. The service will be free.

This surely is a fine thing, and we recommend an extension of the practice.

## T ¶ *What Is This "Craft Morale"?*

THE number of comments received thus far on the new standard release print is very few, and the reaction of the craft as a whole to this effort to do it a service is disappointing. Quite a few standard prints are already in circulation, especially in the larger cities, yet suggestions on the new plan continue to just trickle in. It's a strange thing, this apparent indifference of projectionists to all efforts to do them a service; they almost make one feel that one is a meddler. But let someone arise to point out this deficiency in craft morale and immediately there is let loose a torrent of argument calculated to prove that projectionists are beyond reproach. More about this anon.

For the present the important thing is that there be received as many comments as possible on the new standard print. This mark of courtesy is due those men who have already given and are still giving much time and not a little work in the interests of the craft.

## N ¶ *After the Battle Is O'er*

NOW that the smoke of battle has lifted from the scenes of many recent wage scale discussions, we are able to get a little clearer picture of just what happened and, for the benefit of certain calamity howlers who predicted the ruination of the industry as a result of exorbitant union demands, just what didn't happen. What do we find? We find that things are running along pretty much the same as they were before September 1 last, with a few increases granted here and there, and a similar number of *decreases* granted there and here. Everything is nice and peaceful, men are reporting for work at the same old time and finishing up at the same old time, and all in all the picture appears as pretty much alike that which was on display prior to September 1.

Oh well, it would be a pretty dull world if we didn't have the labor unions.



# Efficient Sound Reproduction

By R. H. McCULLOUGH

*Supervisor of Projection, Fox West Coast Theatres*

**G**OOD projection and good sound reproduction is impossible if the equipment is in poor condition. It is advisable to replace worn parts from time to time. Do not allow your equipment to run down to a point where everything is worn out. This is false economy. Be positively sure that the sound reproduction in your theatre is as nearly perfect as possible. It is the duty of every projectionist to make an effort to keep all the equipment up to date.

One of the most important items in connection with the sound reproducing equipment is the care of wet storage batteries. Dampness and dirt on the battery tops permit the electric current to leak away, and this leakage may cause noise which will be perceptible in the reproduction. Keep the battery terminals clean at all times. It is advisable to solder the battery terminals to the connecting straps so as to avoid corrosion.

Never allow the electrolyte to fall below the tops of the battery plates. Add sufficient water so that the electrolyte level is just above the tops of the plates. If the battery needs water, add the water just before charging. This allows the water to mix thoroughly with the electrolyte during the charge, as there is always some bubbling or gassing during the charge. Do not add water just before or during the presentation of sound reproduction.

## Regular Inspection Essential

Projectionists have been advised from time to time to inspect the sound reproducing equipment thoroughly before the performance. The pick-up apparatus should be inspected carefully. When testing the horn receiver units, check each horn unit individually so as to ascertain positive operation. On many occasions it has been found that, after theatre patrons had complained about not being able to hear from where they were seated, a horn unit was dead, which criticism could have been easily avoided if the proper test had been made before the performance.

The exciting lamp, or reproducer lamp, plays a very important part in Movietone reproduction. Always see that the light beam is adjusted properly before starting the projector—otherwise, loss in volume or distortion will be the result.

## Meter Fluctuations

When any of the meters fluctuate, connected to circuits on the sound reproducing equipment, this means trouble. The photo-electric cell am-

plifier and also the 41-A amplifier are so arranged that the filaments of the vacuum tubes employed in this amplifier, are wired in series and the filament brilliancy is accomplished by a variable resistance in conjunction with a meter which indicates the magnitude of current in the filament circuit.

The filament current should always be constant during operation. This means that the indication on the filament current meter must be steady. A fluctuating meter indicates that the filament current is unsteady, which may be caused by several defective conditions. First, it may be due to a poor contact at the meter terminals. Second, it may be due to a poor contact between the tube contact tip and the socket prong, caused by corrosion or a bent prong. Third, it may be due to corroded battery terminals; or, if a motor generator is employed to supply the filament current, it may be due to sparking brushes at the commutator or imperfect operation. Fourth, it may be due to one of the filament circuit connections which have worked loose either in the amplifier or in the circuit between the source of the filament current supply and the amplifier.

The plate current meter should also indicate a certain value without fluctuating. A fluctuating plate current meter may be attributed to several faults. First, it may be due to an overload condition. By overloading, we mean the application of excessive input and the inability of the tubes to handle this overload, which causes distortion. Second by a poor contact in the plate circuit, which will also be very perceptible by noise in the reproduction. Third, the improper operation of the unit, which supplies the plate potential, which may be a rectifier, batteries or motor generator set. Low plate current may be due to a defect in the tube, usually low electronic emission.

## A Return to Fundamentals

It is our aim to make the sound coming from the sound reproducing equipment as nearly as possible an exact reproduction of the original sound. In transmitting sound by electricity the transmitted current is necessarily alternating in character. Even in those cases in which the vibrations are impressed upon a steady current, the operative or sound producing portion of the resultant current is alternating, and obeys the same laws as the simple alternating current.

The pitch of sound depends upon

the period or frequency of vibrations of the fundamental note, and would be the same were all the overtones destroyed. The sound of the human voice is produced by the vibration of a thin elastic membrane at the top of the windpipe. The air from the lungs, passing through a slit in this membrane, sets it into vibration and, as the tension on the membrane is varied, its rate of vibration changes accordingly—thus varying the pitch of the fundamental and its many accompanying overtones. With the aid of the mouth the fundamental tone and the overtones are mixed together in different proportions, and in this way the different vowel sounds are produced. To recognize and understand spoken sounds, it is not necessary that they should be loud. The faintest speech is readily understood if only it is clear. Poor tone quality does not always mean that the loud speakers, tubes or transformers are causing distorted output.

Some people, we are sorry to say, do not use the best judgment in the matter of controlling the volume in the theatre auditorium. We have pointed out many times the importance of rehearsing every production for the proper fader setting. A medium volume of sound is far preferable than too much. In many instances, if the volume is raised to a maximum, distorted sound will be the result.

Every theatre auditorium has a certain volume to fill. It is necessary that the sound reproducing amplifiers have the ability to deliver sufficient power to take care of any overload, when excessive volume is required—otherwise, distortion will be encountered.

Movietone equipment requires careful attention at all times for successful operation. Projectionists should be very careful, before starting the projector, to see that everything is ready for operation. It has sometimes happened that projectionists to forget to close the switch, controlling the movietone amplifier and exciting lamp. After making the change-over the fader would be brought to the normal operating position as soon as the error was noticed the switch was suddenly thrown in with the fader still in the normal position, which would produce a blast sound loud enough to startle the audience out of their seats.

If you have started the projector—brought the fader up to the normal operating position—and then discover that you forgot something, bring the fader to zero and correct your mis-



# U.S. NAVY SELECTS RCA and Awards Largest order in History

## 20 BATTLESHIPS

Mighty fortresses of the sea magically transformed into floating auditoriums for naval educational work, and for the recreation of officers and men.

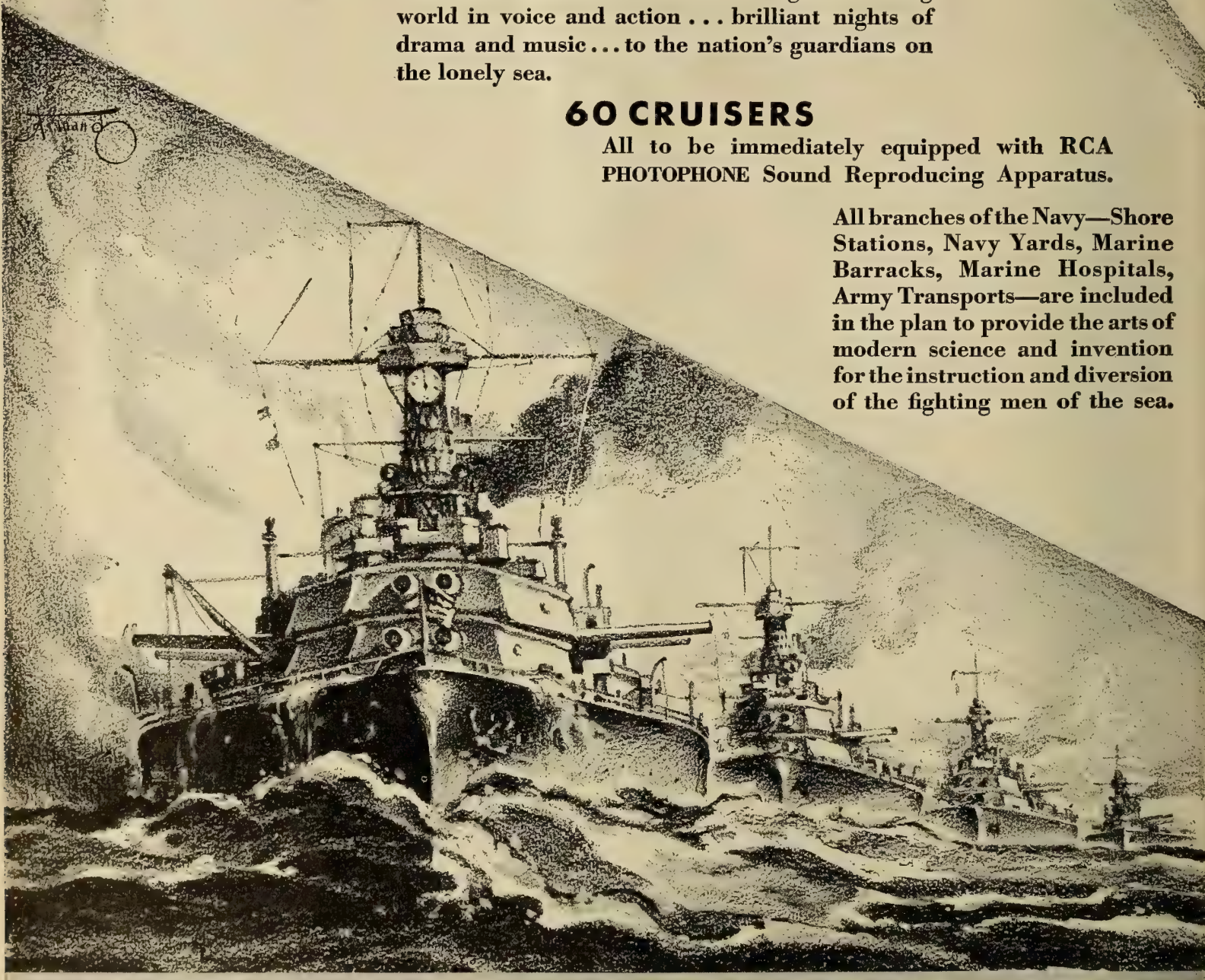
## 120 DESTROYERS

This marvelous era of sound brings the living world in voice and action . . . brilliant nights of drama and music . . . to the nation's guardians on the lonely sea.

## 60 CRUISERS

All to be immediately equipped with RCA  
PHOTOPHONE Sound Reproducing Apparatus.

All branches of the Navy—Shore Stations, Navy Yards, Marine Barracks, Marine Hospitals, Army Transports—are included in the plan to provide the arts of modern science and invention for the instruction and diversion of the fighting men of the sea.



# RCA PHO

EXECUTIVE AND COMMERCIAL OFFICES, 411 FIFTH AVE., NEW YORK CITY ... BRANCH



# PHOTOPHONE EQUIPMENT

## for Sound Reproducing Apparatus

Battleships . . . Destroyers . . . Cruisers! The Mighty Fleets of the U. S. NAVY will use RCA PHOTOPHONE EQUIPMENT in showing talking pictures to the Fighting Sons of Uncle Sam!

Following the *most exacting tests*, RCA PHOTOPHONE won the award in open competition!

TESTED AT SEA by Naval Experts . . . in fair weather and foul . . . against the vibration of heavy gun fire . . . shellshock . . . magnetism from armor plating . . . corrosion! Tested for steadiness of picture and trueness of sound in the face of pitching seas and heavy gales, a thousand and one conditions never to be encountered in a theatre, RCA PHOTOPHONE *won on Price, Sound Quality and Intrinsic Merit!*

This unqualified endorsement of RCA PHOTOPHONE Sound Reproducing Equipment, for all branches of the U. S. NAVY on Sea and Land, ANSWERS ALL QUESTIONS as to price, performance and *sound satisfaction!*



# TOPHONE

OFFICES IN PRINCIPAL CITIES OF UNITED STATES, CANADA AND FOREIGN COUNTRIES



take. On many occasions, I have found that the projectionist had removed the sound gate and when starting the projector discovered his mistake and then endeavored to insert the sound gate in position without bringing the fader to zero.

It should always be remembered to bring the fader to zero, when encountering difficulties of this nature, and after correcting the trouble always advance the fader slowly, instead of quickly.

#### Points to Remember

Two other very important things in relation to the pick-up system are that you make certain, before threading film in to the sound gate, that the sound band track is perfectly smooth and free from any and all deposits. Be positively sure that the loops are the right size, because if they are not a slight lack of synchronization will be the result.

An exciting lamp filament may possibly fail during the presentation of a Movietone subject. RCA equipment is equipped with a turret, which holds three exciting lamps and either one of these lamps is always ready to be swung into operating position providing the one in use would burn out. However, other sound reproducing equipments are now equipped with this feature, and it is necessary to always keep a spare lamp bracket with the exciting lamp properly adjusted, so that this unit can be installed within a few seconds.

It is imperative that the exciting lamp and bracket be so placed that it is ready for instant use—otherwise, a long interruption of sound will be encountered. Each Movietone projector should have its own spare exciting lamp bracket with an identification mark, indicating the projector in which it is to be used.

#### Line Voltage Fluctuation

Despite all that has been said and written by power companies and their associations, a positive 110-volt supply is a rare phenomenon these days. Many recording voltmeter charts have been received, and after studying these charts it has been found that the line voltage varies in many places from 85 to 140 volts. It has been mentioned in these articles before that a slight increase in voltage will often cause the vacuum tube filaments to deteriorate very rapidly.

It is by no means uncommon to have the normal 1,000-hour tube reduced to 100 or even to 50 hours on an over-voltage operation. When the line voltage is excessive the amplifier operates with abnormal primary voltage, which in turn is transformed into excessive voltages in the filter circuits, plate circuits and filament circuits. More serious still is the strain placed on the power transformers.

#### Insufficient Line Voltage

With excessive line voltage, the tubes glow brighter, but in the ab-

sence of a basis for comparison this may not be noticed, which results in short vacuum tube life. Most projectionists and engineers give very little thought to subnormal line voltage. Insufficient line voltage greatly reduces the efficiency of the amplifier. Vacuum tubes must be operated at a certain temperature for the necessary electronic emission.

Power tubes and rectifier tubes have been known to arc seriously and have been ruined very quickly due to insufficient filament voltage. It is obvious that great care must be exercised in having the correct filament voltage for all vacuum tubes, as carelessness in this matter will increase the operating cost.

#### Concerning Amplifiers

The amplifier with its associated apparatus is not a highly complicated

electrical system. With careful study of every schematic of the equipment you are operating, the sound reproducing system will become more simple. The feeble impulses in the amplifier are amplified with the help of electrons rushing from filament to plate at a speed above ten thousand miles per second. This current is silent, but it carries with it voice or music which is heard as sound from the output or loud speaker.

If the original sound has been amplified perfectly, if none of the subtle variations have been lost from circuit to circuit and from tube to tube and if no extraneous effects have been introduced, the output will be faithful reproduction of the sounds impinging the microphone during the recording. Perfection of sound reproduction is not an impossible accomplishment.

Every projectionist is supposed to

---

## W. E. Equipment Designed to Meet Varying Voltage Conditions

---

By C. Flannagan

Engineering Dept., ERPI

**I**N designing sound picture equipment careful consideration has been given to the establishment of the voltage range over which the equipment will be called to operate. Variations in voltage fall naturally into two classes. In the first of these the voltage is fairly constant, but consistently above or below the nominal value. Such conditions may exist where a theatre is located at the extremes of the power distribution system. The voltage will be high or low, depending on whether the theatre is near or far from the power distribution point.

The second class includes that condition which exists on a power line on which the load is apt to vary considerably at certain periods of the day. This condition frequently results from fluctuating loads, such as elevators, motors, and lamps in the theatre building itself. Such a condition might exist, for instance, where a theatre obtains its power from the same line which supplies a large factory. Unless the regulation is very good, the sudden decrease in load due to the factory shutting down, say, at five o'clock in the afternoon, would result in an increase of the voltage in the theatre to an abnormal value. In some cases the two conditions described may exist simultaneously.

#### Economic Compromise Between Costs and Results

As in all design work, the final solution involves an economic compromise between the cost of the equipment and the results desired. The AC amplifiers for use in W.E. sound picture equipment are designed to operate from the normal range of voltages commonly encountered on commercial power systems. Although it was recognized that voltages below and above this range would be encountered, to have designed amplifier equipment to operate beyond the normal range would have involved considerable additional expense. This would result in the exhibitor whose theatre voltage was normal paying for equipment which would benefit only those few exhibitors who happened to have theatres with abnormal voltage conditions.

To take care of the abnormal cases auxiliary equipment has been designed and is available to bring the voltages within the range over which the amplifiers are designed to operate. To correct line voltages that are fairly constant, but above or below the normal range for which the equipment was designed, the TA 4005 Line Voltage Regulator (W.E.), is available. The installation of this regulator will permit the use of voltages as low as 95- and as high as 125-volts for the operation of W.E. sound equipment.

To correct line voltages which fluctuate more than 5 per cent from their normal value, the 707-A Control Cabinet is available. When the voltmeter in this cabinet indicates that voltage adjustment is needed, it is made manually in 5-volt steps by operating snap switches in the cabinet. The 707-A Control Cabinet is also used to correct in cases where wide fluctuations and abnormal line voltage exist simultaneously.

Should marked fluctuations occur oftener than four or five times per hour, the matter should be called to the attention of the power company.

---



have an electrical education and this does not necessarily mean that he be an electrical engineer; however, if the projectionist is an electrical engineer he will be able to solve any amplifier problems regardless of his lack of familiarity with similar instances. It is very important to read references regarding trouble shooting as they will invariably make clear the problems which seem difficult to you and this will also solidify the explanations you have already grasped. All parts employed in the sound reproducing equipment are selected for their quality, and are such as to provide an ample factor of safety.

### Handling Film

It is very important that motion picture film be handled with great care. We have been asked many times how long a sound track print will last. From my observation, the number of times a sound track print can be used depends entirely on the wear and tear and the care it receives. When the average print is used a few hundred times, it will become buckled and warped.

With the advent of sound and the installation of the perforated sound screens it was necessary to increase the screen illumination. This increased the heat at the projector mechanism aperture, which is entirely responsible for the buckling of film. The introduction of the rear shutter on the Motiograph and Simplex projector mechanisms, have eliminated the buckling of film—however, it will be some time before rear shutters are adopted generally by all theatres. When film becomes buckled and warped, it not only causes an in-and-out-of-focus effect on the projection screen, but it also prevents the sound track on the film from traveling over the sound aperture in a perfectly flat plane. If the film sound track is not held in a perfectly flat plane at the sound aperture, distortion will be encountered.

### Scratches, Dirt, and Oil

Scratches, dirt and oil are very detrimental to the film sound track. We have found that if the film sound track surface is free from dirt, oil, sprocket tooth marks or deep scratches, the tonal quality of a film sound track will be just as good with the hundredth screening as at the first screening. There are certain rules in handling film which apply more forcibly to sound film. These apply especially to examination, splicing and rewinding. It is very important that film be inspected after each showing. Test each patch for complete adherence across the whole width of the film.

If the splice is weak, loose or otherwise poor, renew the splice immediately—otherwise, an interruption is likely to occur. The splicing of film with a sound track is a very simple process. Many projectionists do not block out splices made on sound track film. A plain splice no matter how

well made, will cause a click in the sound reproduction as it passes through the sound reproducing mechanism. It is important to block out each splice at the sound track as mentioned before.

### Rewinding Evils

Be very careful while rewinding film that the circulation of air in the projection room or inspection room is free from dust. Most projection rooms are equipped with an enclosed rewind, which prevents dust and dirt from collecting on the film. If dust and dirt do collect on the emulsion, it will usually be pressed into the surface, which results in minor scratches.

Film should be rewound at a low speed with medium tension. Pulling and jerking must be avoided. Minor scratches on the emulsion of the sound track do not have any notice-

able effect in the sound reproduction. If the scratch is wide and the surface dark the only effect this will have on the sound reproduction is a decrease in volume in proportion to the amount of the area of the sound track that the darkened scratch would cover. If the scratch causes an abrasion, removing the emulsion at intervals, a sputtering noise like that of radio static will be heard in the sound reproduction.

Projectionists should be very careful about oiling the projector mechanism—never allow surplus oil to flow on any part where the film travels. If oil gathers on the film sound track there will be a decrease in volume. If the sound track motion picture film receives the best of care, the physical life will be greater than the booking life.

## A Mobile Sound Picture Theatre

ONE of the features of the recent political campaign in New York State was the utilization by the Democratic State Committee of a fleet of trucks which were completely equipped to show sound motion pictures. The trucks were outfitted, manned, and operated by Local Union 306 of New York City on a commission from the State Committee. Two shows daily were given, and it is estimated that the entire fleet gave more than 350 separate showings during the time they were out. Two men manned each truck. The afternoon shows were given indoors, the portable sound equipment being removed from the truck and set up in the hall, school, church, store, or wherever the program was to be offered. The evening programs were given outdoors, weather permitting.

Campaign speeches, recorded in sound motion pictures by Governor Roosevelt and other candidates on the Democratic ticket, were reproduced on a screen 6 x 6 feet, outdoors, while a 10 x 10 size was attained indoors. In addition to the projection of the recorded addresses of the various candidates, the trucks were so equipped that a platform of sufficient length and width to accommodate two persons extended from the rear, and upon which was mounted a microphone connected to the loud speaker, when any candidate wished to appear in person. Also, a synchronous disc turntable was employed to present musical programs whenever desired.

Of interest is a brief resumé of some of the equipment carried on a single truck, as, for example: One 500-watt motor generator (d.c. districts); one Sure-Fit projector; Holloway sound head; a 3-stage, double-channel amplifier, 2 microphones, an electrically-driven Victrola; G-M Laboratories V-71 photo-electric cells; 1 Racon speaker unit; 2 sets of motors for a.c. and d.c.; a beaded and perforated screen, mounted on a spring roller and collapsible in a small case; a

Forest Unitron; and a Morelite lamp.

It is a tribute to those members of Local Union 306 who supervised the equipping and maintenance of these trucks that not a single program had to be cancelled as a result of failure of the apparatus. Under the personal direction of Sam Kaplan, who conceived the idea of the sound picture trucks and who followed closely the development of the work. Dave Narcey acted as general superintendent, and was assisted by William Mayer and Fred Castle.

Commenting on the results of the campaign, President Kaplan said: "The results obtained from the use of these sound motion picture trucks was beyond all expectations. No sooner had the trucks made their first few appearances than the Local Union offices were flooded with requests from district leaders all over the State for engagements, which requests, of course, had to be refused because of the complete itinerary prepared in advance for each truck. If we had had a dozen additional trucks we could have kept them busy in various sections of the State; and we even had requests for similar equipment from outside New York State.

"Naturally I am immensely pleased with the results secured, and I am proud of the fine craftsmanship displayed by Local Union members in charge of the work. By their painstaking work and careful attention to the many small details involved, on both the layout, equipping and operation of these trucks, they have demonstrated the worth of the craft and have aided in introducing a 'new idea' in the dissemination of propaganda. These sound trucks have come to stay, and in future they will be in demand for many purposes other than political work. Already there are apparent certain signs which indicate that such equipments will find application to many fields of endeavor, particularly in sales promotional work."



# Opinions on Standard Release Print

**I**NSUFFICIENT time has elapsed since the last issue of *MOTION PICTURE PROJECTIONIST* to make possible the presentation herein of representative comment on the new standard release print, announced in the last issue. Also, too few standard release prints are as yet in circulation to permit of at least one having been run in every section of the country. Not until after December 1st will enough standard release prints be in circulation to enable the organizations sponsoring the new plan to gain an accurate index as to how the plan will progress.

Distribution of pamphlets setting forth the plan in detail is still in progress through the combined efforts of the Academy of Motion Picture Arts and Sciences and the Projection Advisory Council, the latter organization having blanketed the entire roster of International Alliance Local Unions in this country and in Canada with information on the new print. In addition to the physical work of distributing the pamphlets, the Council will shortly announce the appointment of 35 key men in various sections of the country who will work in conjunction with producer representatives in seeing that the release print plan is afforded ever possible chance of success.

These key men will continue to function as sectional representatives on all other undertakings of the Council.

## Minor Changes Suggested

A majority of the comments received to date indicate that the plan as a whole is eminently satisfactory, criticism in the main being confined to suggestions for improvement of certain details. For example, it seems to be pretty generally agreed that the black dots mar the pictorial beauty of the picture, and it has been suggested that there not only be fewer dots but that their position be altered so that they will show up nearer the side and top of the picture. Of course, there is ample reason for looking on this suggestion with suspicion, for the reason that some projectionists may go to no little trouble to frame out the dots altogether.

Indicative of the amount of educational work still to be done among projectionists is the information that even with the standard print there persists the old habit of punch marks, clips, stickers, and the like. Council representatives in the field will check all such complaints very carefully, and Local Unions throughout the country will be asked to cooperate with Film Boards of Trade in fixing penalties for such violations. It is not unlikely that if persuasion alone is insufficient to correct this evil, there will be some means agreed upon

between Local Unions and the Film Boards to have the guilty parties punished. Projectionist leaders say that insofar as their men are concerned such steps will be unnecessary, and it is believed that mutilation will in a short time be minimized to such an extent as to be negligible.

The question of extending the standard to short subjects also has occasioned some comment. There are some who hold that if the new release print is to be a "standard" in the strict sense of the word, then shorts should also be uniformly marked. Whether this will be done is problematical at the moment.

## Managers Must Cooperate

One commentator advanced the thought that not a little trouble on the plan may be encountered as a result of the ideas of various managers in hooking in trailers and advertising matter. This phase of the situation will be looked after by the Film Boards; but it is expected that projectionists will cooperate to the extent of reporting such occurrences.

A few representative reports and opinions on the new standard are appended hereto, a typical opinion being that of Victor Welman of Local Union 160 of Cleveland who is conducting a survey of opinion among the members of his Local. Mr. Welman hopes to be able to present the results of this survey in time for the

next issue; meanwhile he has the following to say:

"On the standard release print, I placed five copies of the pamphlet in five projection rooms, insuring the attention of 22 projectionists among whom are all members of the Executive Board. All of the officers of this Local Union have also examined and discussed the new standard.

"The consensus of opinion is that the standard represents the greatest forward step in the interests of better projection work within the past 15 years. Several members feel that one or two minor changes could be made in the standard, but even these men realize that it would be much better to await a majority opinion from men throughout the country before proceeding to make any changes. No doubt the Council and the Academy will watch closely for suggested improvements in the standard, and to this end Local Union 160 has promised the utmost cooperation. I shall be glad to forward to you at a later date the results of the detailed survey which I am making."

Other opinions on the standard are as follows:

Editor, *Motion Picture Projectionist*, Sir: We feel that you will be greatly interested in the enclosed copy of letter which is being sent to all Locals of the I.A.T.S.E. & M.P.M.O., and we trust that you as a member of the Projection Advisory Council will do everything in your power to secure support for the "Standard Release Print." I believe this is the most definite and constructive of the many important activities of the Projection Advisory Council and indicates what can be accomplished for the projectionist through this organization.

It is possible that you may see some changes which could be made, but it was decided to approve in its present form in order not to delay the work of the Technical Bureau of the Academy of Motion Picture Arts and Sciences. Through practical test certain improvements may be suggested and we certainly hope that you and all projectionists will communicate with us if you have any suggestions to make. Please also remember that on this or anything else the Council does, we are always particularly glad to receive a word of approval.

It is especially gratifying to us to have been able to make a close cooperative contact between the Projection Advisory Council and the Academy of Motion Picture Arts and Sciences. It has been agreed by the Academy that all matters concerning projection will be immediately taken up through the Council and that this organization will do everything in its power by recommendation and earnest practical support to assist the Academy in its efforts to solve some of the technical problems of the projectionist.

If we do our part to help make a practical success of the "Standard Release Print," we can be assured that

## Attention, Please

Too few standard release prints are now in circulation to have been received at every theatre in the United States and in Canada; but a majority of the larger theatres have already run such prints. After December 1st there will be few theatres which will not have run at least one standard print, and it should be possible after this date to gather enough comments to accurately judge the value of the new standard.

As stated previously, the standard release print is not worth the paper on which it is written without the active cooperation of projectionists in their daily work and their willingness to submit their opinions on the standard. It is absolutely imperative that as many comments as possible be received. Communications on the new print may be sent either to the Projection Advisory Council, Box 98, G. P. O., New York City, or to *Motion Picture Projectionist*, 45 West 45th St., New York City.



we will be given the fullest possible opportunity to carry on work of this nature which is of such great value to projectionists. It is the support that you and other members of the Projection Advisory Council have given, which enables our organization to serve in such an important capacity and we certainly trust that you will do everything in your power to see that the "Standard Release Print" is put to practical use by the projectionist in the way it deserves.—P. A. McGuire, Executive Vice-President, PROJECTION ADVISORY COUNCIL.

Merrick, N. Y.

P. A. McGuire, P. A. C.

Dear Sir: I have your letter of November 5th, 1930, and the booklet of October 31, 1930, before me. So many producers have gone to the trouble of printing a fine leader and made the number of the reel so small that it can hardly be seen. It must have taken some time and trouble to get all these producers to agree on a standard. All of them were so very far away from anything that looked like a standard. This will be a great help to every projectionist and it will also be a great joy to the audience. The click system now in use is a great failure. No two men wanted the clicks in the same place. I myself have worked with motors that picked up with three feet of film. Where I am now, I need at least the twelve feet and the extra five feet without sound. Now all this fine work will go to naught unless every manager of every theatre in the country is also held liable with the projectionist to see that this is not ruined.

I have worked in two Fox Theatres where the managers would try every conniving method to kid the audience with trailers. They would order us to put these trailers in such places that we would have to cut the leaders or run out in order to get over their pet schemes. Some of these theatre circuits will have to teach their managers how to put up a show. In some Fox Theatres they split the news to put a trailer in the middle of it. In the theatre where I am now all advertising is done either in front or behind the news. So the News is run solid.

The Projection Advisory Council will have its hands full to put this "Standard Release Print" over in the theatres. I would like to see all advertising kept in one spot in the program and have it all together. If we must cut leaders and run-outs, let it be the news. Some of the shorts I get today are very bad.—W. C. Budge.

Colorado Springs, Colo.

Editor, *Motion Picture Projectionist*. Sir: We are just in receipt of a copy of the "Standard Release Print Make-up and Practice" which you have so kindly sent to us. It covers in detail a subject matter in such a manner that it should forever preclude further mutilation of prints, and graphically displays the remarkable and necessary agency the Projection Advisory Council is to the motion picture industry. However, it has been my experience to have already received and handled prints made up as per the specifications outlined and

found various indicators still being placed on them in accordance with conveniences practised by some careless and unthinking projectionists, in spite of the fact that the standard markings were amply sufficient.

While the uniform specifications will go a long way toward solving the industry's greatest problem, this problem will not be fully solved until the projectionist himself is educated or forced to play his part in the advancement scheme to the end that he will not further double-up reels and mutilate film to his own advantage.

In the way of suggestion that will tend toward improving changeovers between the end and beginning of different subjects, particularly in the case of disc prints when a rehearsal is not to be had, the frame in light aperture position on the last and first note of the closing and introductory music score respectively should be designated. This will help to obviate the breaking off abruptly of the music score and the changeovers will be smoothly made. Of course, in the case of film sound prints this will not be necessary.

Also, the audible advertising of the producing companies' trade-marks should be discouraged. Such credit trade-marks as a barking dog, radio station call, rooster crow, etc., only use unnecessary footage and in the majority of occasions is justly deleted by the exhibitor to the end that it makes for further film damage. The producing companies using such credit and end titles should be encouraged to choose a more dignified manner of identification, more in keeping with the production; and that will meet with the approbation of the exhibitor.

The undertakings of your Council merit the cooperation and support of every projectionist.—Louis Ziman, Secretary, L. U. 62.

Aberdeen, S. D.

Editor, *Motion Picture Projectionist*. Sir: We have received full data on the standard release print through the Projection Advisory Council, for which please accept our thanks. We note with interest that numerous difficulties heretofore associated with prints and changeovers will be done away with by this new standard. It is useless to state here just what benefit will accrue to the industry as a result of the adoption of this standard, as this can only be estimated after the projectionists throughout the country have given the plan a fair trial. Please accept our thanks for your interest and be assured of the cooperation of our members.—R. W. Merrifield, Secretary, L. U. 525.

Ticonderoga, N. Y.

Editor, *Motion Picture Projectionist*. Sir: After reading your article in MOTION PICTURE PROJECTIONIST on the new standard release print, I can only thank you and praise the other members of the standardization committee for their efforts to bring about this new system which, I am sure, will prove of great value to the industry. I welcome this new standard; and I hope that projectionists throughout the country will demonstrate by their work that they realize the full value of such a standard and

appreciate the work of their fellow workers in the interests of the craft.—Bruce Clark.

New York City

Editor, *Motion Picture Projectionist*. Sir: I have considered very carefully the new standard release print, and I believe it to be a mighty good program to be carried out. Time alone will demonstrate the worth of this standard, but meanwhile every projectionist should do all he possibly can to insure the standard getting a fair trial. Changes will come only as a result of the experiences of the projectionist, thus it is absolutely necessary that we have as many comments on the plan as possible. Please be assured of my utmost cooperation with you in your efforts for standardization.—Felix Charney, Supervisor of Projection, Fox Theatres.

Sleepy Eye, Minn.

Editor, *Motion Picture Projectionist*. Sir: This morning we received and screened our first standard release print. We have disc equipment only, and after figuring out the exact turns down, found that one and one-half down made the changeover perfect. One and one-half turns down leaves about 8 feet of film to run through the incoming projector before the change is made. The dots are easily seen on the screen and are far enough apart between cues to make the change go off smoothly. The only thing objectionable to me about these dots is that they tend to mar the pictorial qualities of the picture; but even at that they are a great improvement over the familiar scratches, punches, stickers, etc.

On the whole, the standard print is great. I took great pleasure in running this one. Its main advantage lies in the insurance of a uniform start and the elimination of cue sheets. Even with the best of cue sheets the changeover was a difficult job because most of the sheets were inaccurate.—Cedric Gehike.

New York City

Editor, *Motion Picture Projectionist*. Sir: In the Standard Release Print, there are many good things, but I and many other projectionists disapprove very much of the black spot cue changeover prints to date as the spot is so pronounced that the audience can plainly see every changeover. In the case of a letter title, etc., black spots flash as would a punch-hole in dark film and are very undesirable. These black spots really appear as though they were punch-holes in the negative, and it is just like changing the color of the old punch-hole from white to black, which we want to do away with. In the case of a dark scene, the white circle around the black spot is also too pronounced. In short, instead of making punch-holes with white light to show on the screen we are making punch-holes cutting off the light.

Last week, one of the new prints we ran with the black spot cue marks certainly convinced us how the projectionists who ran it ahead of us liked it, as there were all sorts of scratches, holes, strips of dark film, etc., on same, which showed us that  
(Continued on page 44)



# in the Laboratory

Conducted by SAMUEL WEIN

## Mechanical Sound-on-Film

**A**N interesting comment on a "new" recording process appeared in the French journal *Le Cineopse* reflecting the vast amount of experimental work which is in progress to find a substitute to replace the conventional sound-on-film process. While keeping in mind the recent announcement of George Spoor on his new recording and reproducing process, and the not so recent Von Madaler contribution (both of which processes have been discussed in these columns), let us examine this French contribution. *Le Cineopse* states:

"A new method of recording and reproducing sound, said to be of the greatest resonance, has just been developed by a Frenchman, M. Nublat, and a company for its exploitation has been incorporated with a capitalization of several million francs. M. Nublat has completely changed the old methods of sound-on-film recording, to the great advantage of the exhibitor, who will no longer have to pay the heavy tribute exacted by the monopolies controlling the recording processes now in use.

"The recorder is of such simplicity that its operation cannot be in any way interfered with, and its installation in the studio will be no more expensive than the cost of a first-class camera.

"The reproducer is likewise of astonishing simplicity. In the new principle of this apparatus, the photo-electric cell is entirely done away with, and with it, naturally, all its numerous inconveniences. It utilizes in the more

battery, lamps, etc., of the maintenance of these invariably delicate units, and their high first cost.

"Undoubtedly, if such a system as this is successful, it will prove of considerable importance in not only the fields of theatrical production and exhibition, but particularly in the industrial and home-talkie fields as well."

Our reaction to the foregoing is as follows: The deposition of magnetic elements or compounds on the film is decidedly old. One experimenter used the conventional silver emulsion and thereafter deposited on the "sound track" a compound that is magnetic. Another worker used the same idea, his process differing only to the extent of the use of an "iron developer," thus simplifying the procedure, since it is so much easier to deposit iron on the developed image. Iron developers are a thing of the past. Incidentally the correct name for it was "iron oxalate."

Still a third worker has a reservoir containing a compound which had a very fine siphon tube running from this source onto the film. On to this deposited track was built up a thicker magnetic material. The difficulties with such processes are as follows: (1) Deposited compounds eventually rub off because of friction. (2) The pressure pads, etc., in the projector must be modified to additional permit space to the extent of the height of the deposited compound. (3) As yet it is extremely difficult to make duplicates from the original. (4) The projector helps to form a troublesome magnetic path between the record and the amplifying units.

## A New Anti-Click Patch

Mr. E. Sponable finds that clicks resulting from patches (sound-on-film), can be eliminated by the gradual decreasing of the light from the slit and through the film, and thence gradually increasing the light beam. In other words, if the exciting light is permitted to pass through the patched film, the click will be heard; but if the light is varied gradually as the patched film is brought into focus of the slit and light sensitive cell, the

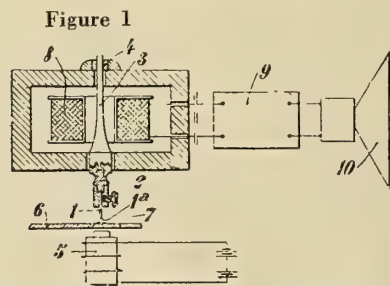


Fig. 1. Schematic diagram of Nublat magnetic reproducer. 1. Magnetic metal shank which picks up the sound vibrations. 1-a. The end of the shank remaining at all times at a distance sufficient to permit the passage of the film without friction, and consequently without wear. 2. Non-magnetic housing. 3. Second shank modifying the strength and direction of the current flowing through the coil (8). 4. Rubber blocks. 5. Electromagnet. 6, 7. Film, and phonographic groove. 8. Coil influenced by the magnetic current which induces an electromagnetic current modulated according to the phonographic record. 9. Amplifier. 10. Loudspeaker.

Fig. 2. Line drawing of Nublat sound-on-film recording, showing the phonographic record formed by a deposit of magnetic material incrustated in the film.

or less conventional manner, a moveable shank of magnetic metal, placed in a field such that, proportionally with the movement of the film, upon which is a phonographic groove of magnetic properties, the shank follows the recorded vibrations, as it invariably follows the path of least resistance to the magnetic circuit, and this without any friction upon the film-record. The superiority of such a system is evident. The phonographic groove of the film passing at normal speed between an electromagnet and a shank which transmits the sounds to the pick-up, thence to the amplifiers, and loud-speakers, explains a purity of tone superior to that of the best disc recordings, due to the elimination of all friction, and therefore of all surface-noise. This also means the absolute elimination of the photo-electric cell, of its exciting-

Figure 2

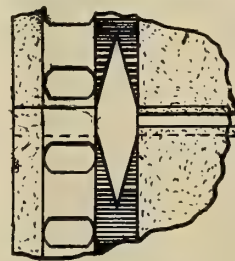
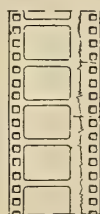


Fig. 1

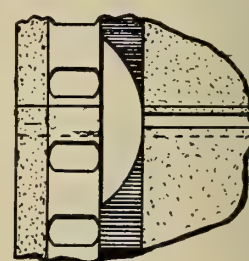


Fig. 2

sudden breaking of the light beam is obviated. In the patent specification Mr. Sponable refers to the printing of such a means for gradually increasing or decreasing the light on the sound track. However, the same means can be carried out by the projectionist.

The details of the patch are seen in Figures 1 and 2. In Fig. 1 the sound track is seen as a triangular form; whereas, in Fig. 2 the modified form of the sound track is seen in the form of a semi-circle. The patching of the film proper is the conventional one, but the sound track may be formed by any convenient means, as by painting the design either by means of a brush or by a stencil.



## New Equipment and Appliances

### New Fire-Resistant Screen Made by du Pont

The most important angle, stressed in all fire prevention and safety campaigns, is that of reducing the loss of precious human life, principally through the use of fire-resistant materials and appointments in public and private buildings, where crowds of people work, study or gather for recreation. Directors of public safety and fire marshals in nearly every state in the Union are insisting, as far as practicable, that fire-resisting materials be used throughout.

One of the first important classes of building owners and managers to realize the necessity of eliminating hazards, preventing the loss of human life, and protecting their investments, was the theatre man. Through his insistence and demand for products that were fire-resistant, manufacturers in their endeavor to co-operate whole-heartedly with him have instructed their laboratories to devote unceasing efforts to the development of materials that will successfully cope with the devastating action of fire. One of the most important products which theatre men have repeatedly demanded is a fire-resistant motion picture screen. Such a product is now announced as among the latest developments of the du Pont laboratories. Months of intensive study and research were devoted to this problem. Scores of formulas were compounded and discarded as unsatisfactory. And now the results of this hard work on the part of the du Pont research chemists assert themselves in the form of this new and much desired fire-resistant motion picture screen material.

It has been subjected to all forms of rigorous tests, both in the du Pont and National Fire Underwriters laboratories. Two of these unusual tests

are pictured in the accompanying illustrations. The material has received the approval of the National Board of Fire Underwriters, which makes the following important statements in its report.

#### Is Non-Combustible.

"The product in single sheets as used in theatres will not burn or propagate flame beyond the area exposed to the source of ignition. The product in compact form can be ignited with difficulty resulting in



The same material kept indefinitely in a Bunsen burner flame will not ignite

smoldering (flameless), combustion. The product is relatively stable and not liable to undergo decomposition or change resulting in an increase in hazard.

"Tests of the product which has been subjected to aging tests did not show any change with respect to combustibility."

Aside from the all-important fire-resistant feature, this new, approved motion picture screen material also has the advantages of a matte finish, which gives a highly uniform degree of reflection, and a construction which permits of easy and clean perforation for sound projection.

Each yard of this material bears the du Pont Fabrikoid oval with the marking "F.R.M.S." below.

### B. & S. 3-Lens Turret

The Basson & Stern 3-Lens Turret will accommodate 3 lenses of any size necessary for the presentation of sound-on-film, disc or silent, or Magnascope. Each lens has a separate focusing device, and there are also provided adjustments for up-and-down and sideways movements of each lens, thus insuring exact line-up of picture on the screen without it being necessary to shift the projector. The makers of this turret stress the fact that exact position register is possible with this turret.

This lens turret is sturdy in construction and utilizes only the very best materials. Simplicity of instal-

lation and operation is assured by the unique design of the turret, it being possible to secure an instantaneous shifting of the lenses by simply raising the knob and shifting the turret, after which the turret is securely locked into position for projection.

#### B. & S. Rear Shutter

Another item on the B. & S. list is their rear shutter—the pioneer rear shutter. A specially designed and patented feature of this shutter is a baffle-type shutter blade which insures a constant circulation of air around the aperture plate and the film the while it throws the warm air off on the sides without affecting the film or the arc. No drilling, cutting, or filing is necessary for attachment of this shutter.

### New Fine Grain Film

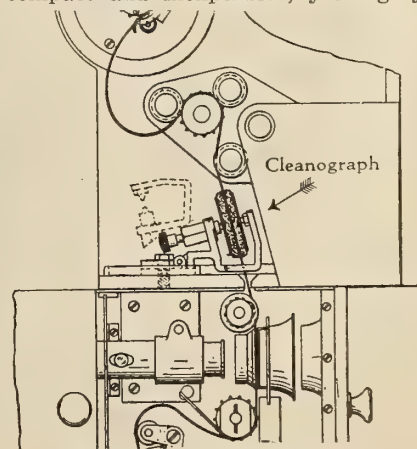
The question of grain is one of ever-growing importance to film men, for this is one of the factors which governs the permissible amount of magnification possible on the screen. Professor Goldberg, a German photographic chemist, has, it is said, just discovered a practically grainless film formula. So fine is this emulsion that it is said to be possible to reduce the photograph of a book image to an area one-hundredth of a square millimetre and later to re-enlarge it to normal size again.

#### Aid to Color

Such an invention would, of course, be enormously attractive to film workers everywhere, particularly in connection with color photography. But it is pointed out that the invention will have disadvantages also. When it is possible to inscribe an entire plan of battle on a bit of paper less than a square millimetre in size which can easily be tucked under a finger nail or invisibly pasted to the skin, the detection of spies in wartime will be practically hopeless.

### Cleanograph for Sound Film

A very interesting adjunct to projection room equipment is the new Cleanograph developed by Advance Laboratories of Rochester, N. Y. This compact and inexpensive, yet highly



The Cleanograph attachment



Every piece of du Pont Screen Material that leaves the plant is subjected to a blow-torch test. Held close to the material for an indefinite time, the flame fails to ignite the screen



useful item, appears to be the answer to the bugaboo of dirty sound prints. The device consists of two felt discs of the inverted type. The film passes through these two discs just before it enters the sound gate, the discs revolving with the passage of the film, thus obviating any gripping and the subsequent introduction of flutter.

The Cleanograph is installed onto the projector just below the take-up sprocket, thus insuring the cleaning of the film just before it enters the

sound gate. The Cleanograph discs do not clean the entire film but only the sound track, the discs being so installed that they cover only the sound track. Extensive tests have demonstrated that these discs remove entirely all traces of dirt from the sound track. There is no possibility of gripping or causing flutter. The device has been approved by all the leading sound equipment manufacturers and may be obtained from Advance Laboratories, Rochester, N. Y.

## New Lens Aligning Device for Regular Simplex Projector

**T**HE Simplex Lens Aligning Device described herein will appeal to the projectionist as a very simple unit for centering the projected picture on the screen where sound films are projected through a proportional aperture, and where it is desired to change lenses instantly to a slightly longer focal length where silent or sound-on-disk film must be projected.

This device has been placed on the market after careful consideration to the features of design which would furnish the projectionist with an absolutely accurate device upon which he may rely at all times and one which may be readily attached without disturbing any other part of the mechanism and without the necessity for cutting or fitting it to the apparatus. When attached to the Simplex regular projector and used in connection with proportional, standard, Magnascope or other types of apertures, it gives the projectionist at all times complete control of all focal length lenses, and furnishes him with the means for making practically instant change from one focal length to another with the absolute assurance that any lens once focused may be removed from and replaced in the projector as many times as necessary and always remain locked in accurate focus.

**Absolute Interchangeability**  
The Simplex Lens Aligning Device

is so designed that it may be quickly attached to the mechanism after removing the old fixed type lens mount. It is machined in the same jigs used for machining the old type mount which assures absolute interchangeability of parts. The workmanship and material employed are of the same high standard as Simplex projectors.

Fixed focus lens clamps are not furnished as part of this equipment but we have two types available, one for series 2 or half-size lens, and another for series 1 or quarter-size lens. The clamp for the series 2 or half-size lens is shown at A, Fig. 1, and the clamp for the series 1 or quarter-size lens is shown at Fig. 2. By referring to Fig. 1 there will be seen at B a pin projecting from the lens mount proper; this pin is used as a stop for the fixed focus collar A when using half-size lenses, and it is obvious that if this collar is clamped on any half-size lens once focused the lens will always snap into sharp focus when it is inserted in the mount and the stop C brought tightly against stop B. It will also be noted that the lens will always assume its original rotational position.

By referring to Fig. 2 will be seen the stop focus collar for series 1 or quarter-size lenses. The series 1 or quarter-size lens is pushed into sharp focus in the lens mount D, Fig. 1, and clamped therein in the usual manner.

The fixed focus collar, Fig. 2, is then slipped over the lens and brought tightly against the lens mount D with the locating pin H inserted therein, positioned in slot E, Fig. 1. If the



Figure 2

collar, Fig. 2, is then securely tightened on the lens by means of clamping screws G, the series 1 or quarter-size lens may be removed and replaced at will, and will snap into sharp focus with its rotational position always accurately fixed.

### Special Tube Available

In some cases it may be found that half-size lenses do not project far enough beyond the front of the mechanism to allow the use of the fixed focus clamp A. In this case it is necessary only to lengthen the front of the lens by attaching thereto an extension tube similar to that used in connection with the Super Simplex projector under like circumstances. The same is true where quarter-size lenses do not project far enough beyond clamp D, Fig. 1. All that is necessary in this case is to lengthen slightly the quarter-size lens by attaching thereto a longer front tube of the same diameter as the lens. These collars may be procured from the lens manufacturer, the National Theatre Supply Co. or the International Projector Corporation.

At F, Fig. 1, will be seen the lateral aligning lever, and in the position shown the optical axis of the lens will be centered for sound-on-film apertures. This lever when thrown upwards will center the lens on the optical axis of the standard aperture plate for the projection of silent or sound-on-disk prints. On the lever is stamped clearly the letter F on one locating button, and the letter D on the reverse locating button to indicate clearly to the projectionist the position of his lens at any time.

### Simplicity Feature of Equipment

It is felt that the simplicity of design of this lens mount, together with the easy method provided for sharply focusing and locating lenses, will instantly appeal to every projectionist. All that is necessary to fit this equipment to the Simplex regular mechanism is to remove the old type mount and replace it with the mount described herein. Care must be taken to see that the gib, which furnishes tension in the slide and rigidly locates it, is properly adjusted so that enough tension is applied to hold the lens mount rigidly in the focusing slide.

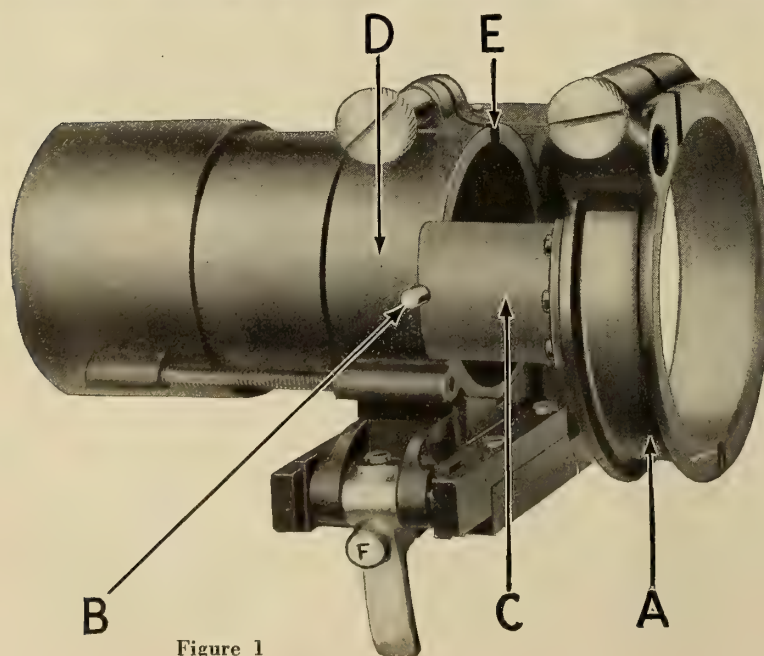


Figure 1



## Instruction via Sound Projection "Schools"

A MOST interesting report filed by the National Better Business Bureau, Inc., of New York, which organization made a thorough investigation of the Projectionist Sound Institute, located in Easton, Penn., is presented here for the general guidance of the many projectionists who have written in from time to time requesting information on projection schools in general and the Projectionist Sound Institute in particular. Readers of this publication will recall the controversy precipitated some months ago by the activity of these projection schools, which activity resulted in President William F. Canavan issuing a general ban against all such enterprises. The Better Business Bureau report follows:

Numerous inquiries have been received concerning the Projectionist Sound Institute which is engaged in selling a correspondence course in motion picture sound engineering. The principal of the enterprise appears to be F. A. Jewell. The price of the courses sold by the institution varies. The course itself is said to consist of approximately 52 lessons and to require an average of one year for completion. The institute was founded on or about September 1, 1929, according to Mr. Jewell.

Some months ago we asked Mr. Jewell for certain information which we considered important for the purpose of answering inquiries competently. We wanted to know how many students were enrolled in the institute, and were informed:

"We consider this a personal question and refuse to answer, although we might state that our enrollment is in the hundreds."

Asked the number of instructors, Mr. Jewell replied:

"This is rather an indefinite question and can only be answered in a general manner. Our answer is: A sufficient number of instructors to adequately instruct the number of students we have enrolled."

Advertising for Projectionist Sound Institute has stated that there are "thousands of positions open right now for motion picture sound engineers," has supplemented this with numerical estimates and has made other allegations regarding the high salaries paid.

In order to obtain what we considered the most competent advice on these subjects, the Bureau consulted the International Alliance of Theatrical Stage Employees and Moving Picture Machine Operators and another authority constituted to represent the producer and theatre owner.

Estimates given by these authorities, both as to number of positions open and salaries ordinarily paid were emphatically more conservative than those advertised by the institute.

Mr. Jewell was sent this information and his attention was called to the trade practice conference rules adopted by correspondence schools and the Federal Trade Commission. He commented on them as follows:

"We wish to advise you that what you sent us was a Code of Ethics approved by the Federal Trade Commission

and is nothing more than just what the name implies—'Code of Ethics,' and not rules or laws. We have legal counsel to whom we pay good money to keep us informed on the legal phase of all our business transactions and we govern ourselves accordingly."

The institute has informed us that new literature was being prepared, but the most recent that has come to our attention does not appear to have been materially modified in its claims.

The Projectionist Sound Institute has featured a guarantee to secure employment for any student "providing you will maintain an average of 80 per cent or better in your studies." During April, 1930, a Cleveland resident received a letter from Projectionist Sound Institute, signed W. F. Brittain, part of which is as follows:

"Mr. Lester Al Smith, who is a representative of one of the largest sound equipment manufacturing corporations in the world, has prevailed upon Mr. F. A. Jewell, who is one of the foremost authorities on Sound Projection in the country, and General Manager of the Projectionist Sound Institute, to turn over the facilities of the institute and assist him in selecting a number of men who can be trained to take care of the present persistent demand and the vast expansion that his company anticipates."

Subsequently the prospect received a telegram from Mr. Smith urging him to make an appointment. The Cleveland Better Business Bureau reported that Mr. Smith represented himself as being from a certain sound equipment manufacturing company located in New York City and that he told the prospect that upon completing the correspondence course he would be sent to the company named for two weeks' intensive training. We called this to the attention of an official of the company named and were informed that Lester Al Smith was in no way connected with them and that they had no arrangement with Projectionist Sound Institute whereby its graduates would be sent to the company for training.

More recently the institute's literature has represented that, through a

---

*Co-operation is an art not to be had merely by wishing for it. It is not a static but a dynamic art and one that demands intelligence, honesty of purpose and just as constant attention as any other department of the activities of both the Union and Employers. If the profession of a desire for co-operation made by both the parties to this dispute at the hearing is genuine, then the results will be immediate and surprising. Co-operation on the basis of sympathetic understanding on the part of each, of the problems of the other, will begin to reveal vistas of profitable relationships hitherto undreamed of.—National Council on Industrial Relations for Electrical Construction Industry.*

---

tie-up with National Sound Service Bureau and Photo-Electric Research Laboratories, their students can earn while learning and gain practical experience. Letters from National Sound Service Bureau are signed L. A. Smith, Director of Organizations. This organization has informed us that they are an organization of sound equipment and accessories manufacturers, users of sound equipment and sound engineers. We have not received any reply to a request for the names of some of these members. An individual has received a letter from this concern urging him to enroll in Projectionist Sound Institute, and containing the following paragraph:

"If you will send us your enrollment fee for P. S. I., immediately taking advantage of the cash which would enable you to get the lessons as quickly as you could absorb them, we will guarantee to start you in a steady job with us within four months after receipt of your enrollment at a salary of \$60.00 per week, but inasmuch as so much rests with you and the time you devote to your studies, we must reserve the right to have the P. S. I. refund your money in full if you do not make good after a fair trial."

Photo-Electric Research Laboratories is located at the same address as National Sound Service Bureau. A letter signed by Herbert Pratt, Director of Sales, tells us that his company is a merchandising organization employing students of Projectionist Sound Institute as agents on a strictly commission basis.

The latest inducement offered by Projectionist Sound Institute that has come to our attention appears to be a "Special Cash Offer" whereby, although the regular price of the course is \$120, prospects are told that \$100 cash will be accepted in full payment and "This \$100 we will reinvest in securing additional members, for which we will pay you 15 per cent of the gross amount received from the members that we secure from the use of your \$100." By this system, the prospect is told, he may expect to obtain a return of his original \$100 investment plus an additional \$20.

## New Resistance Winding

Extreme precision in wire-wound resistors may now be obtained by means of a unique split winding technique developed by the International Resistance Co. Instead of a single winding of a given size of wire, whereby a single turn may, in the case of high-resistance wire, throw out the resistance value more than  $\frac{1}{4}$  or 1%, the ceramic form is wound with a high-resistance wire in one section, and a low-resistance wire in the remaining section, the latter serving to balance the winding to the exact resistance value with extreme precision.

The only problem remaining is one of establishing definite and permanent contact between the two different wire windings. The International Resistance Company's engineers have developed a special molded section between both windings, thereby providing perfect contact between the two windings, just as there is established perfect contact between the ends of the combined winding and the pig-tail leads.



# Review

## How to Prevent Film Mutilation

By Eastman Kodak Company

### II

ON some projectors these rollers are adjustable by means of a collar and set-screw, while on others there is no regulating device. Certain manufacturers using the latter type, rely on the proper centering to be made at the factory, nevertheless there are times when an adjustment is found to be necessary and it is very important that great care should be used in lining up the guide rollers with the intermittent sprocket, otherwise damaged perforations will result. See Figures 5 and 6.

If these rollers bind, the face of the rollers will develop ridges which will roughen the edge of the film as shown in Figure 7. It is also well to examine new rollers closely as in some cases they are received from the factory in a semi-finished condition, and have rough faces against which the edge of the film comes in contact.

### Friction Take-Up

The take-up adjustment should be checked up closely from time to time. An excessive pull can always be detected by the film making a "singing" sound at the take-up sprocket. The

sprocket, of course, acts as a hold-back or brake and puts a strain on the film, when starting on a small hubbed reel. This is sometimes enough to

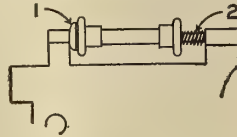


Fig. 5

cause very severe damage to the upper side of the perforation. Figure 8 shows the sprocket damage resulting from a tight take-up.

Proper setting of the spring is a simple matter and care should always be taken to keep the friction disc, whether leather, cork or fiber, absolutely free from oil. Contrary to some opinions oil will not cause smoother operation in a case of this kind, but will really create a certain amount of suction which in turn results in an uneven, excessive pull.

### Tension on Upper Magazine Shaft or Spindle

Some widely used makes of projectors have an adjustable spring

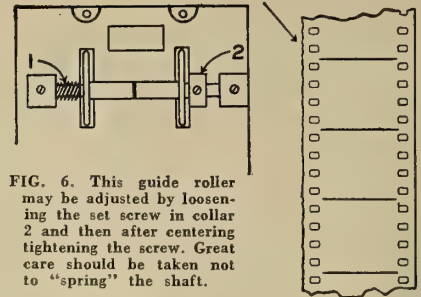


FIG. 6. This guide roller may be adjusted by loosening the set screw in collar 2 and then after centering tightening the screw. Great care should be taken not to "spring" the shaft.

FIG. 7. The arrow shows where the film edge has been chewed away by bent reels or imperfect alignment of the upper magazine.

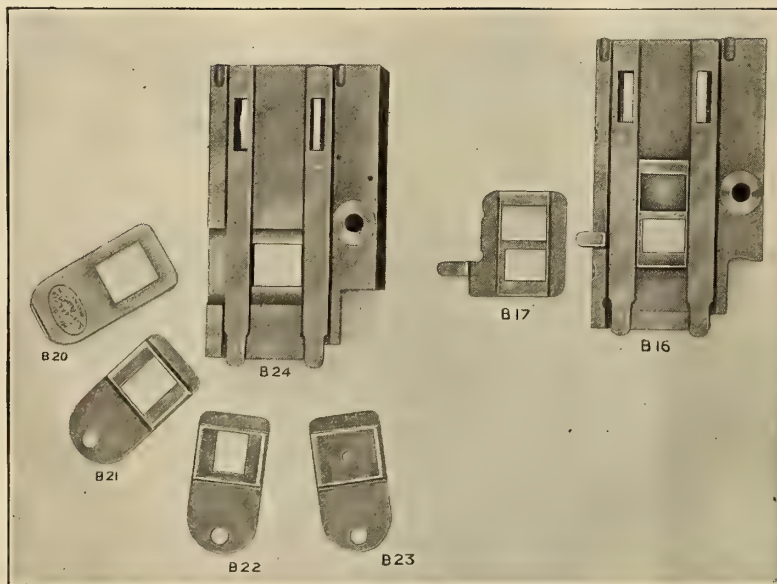
tension on the upper magazine shaft or spindle. Proper adjustment of this spring is important. If set too loosely, the film will come from the feed roll with a jerky motion. This is especially noticeable if used with a bent reel, which is bad for any film, particularly film which is in a dried-out condition or badly worn.

If the tension is too tight the effect would not be noticeable on a full reel of film, but the tension on the last 50 or 75 feet would be sufficient to cause serious perforation damage when a small hubbed reel is used. It is not uncommon for the film to break under this strain.

### Sprocket Idlers

All sprocket idlers must be properly adjusted. If set too far from the

## BLUE SEAL HEAT RESISTING IMPROVED FILM TRAPS FOR SIMPLEX PROJECTORS



MADE OF AN IRON ALLOY

Guaranteed not to Warp under the intense heat of the Arc Spot. A necessity for the Perfect Projection of "Sound" Pictures

- B-16 Film Traps with Sliding Double Round Corner Apertures, one Aperture for Disc and Silent Film and one cut Proportional for Movietone Film to be used with our Adaptors.... \$30.00
- B-17 Sliding Double Aperture Plate ..... 6.00
- B-24 Film Trap with individual mats for silent, movietone and magnascope effect. Traps complete with all mats..... 30.00
- B-20 Master Plate to hold mats stationary ..... 1.50
- B-21 Standard Aperture with Square Corners..... 1.50
- B-22 Proportional Movietone Aperture with Square Corners..... 1.50
- B-23 Blank Mat (CAN BE CUT ANY SIZE APERTURE).... 1.50

Manufactured by

# BLUE SEAL PRODUCTS CO., Inc.

262 Wyckoff St.

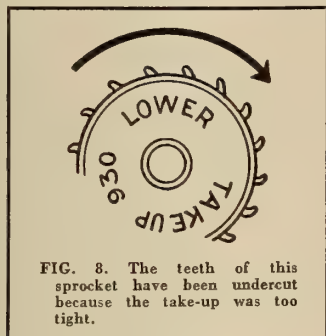
Brooklyn, N. Y.

Manufacturers of Motion Picture Accessories Since 1913



sprocket, the film is liable to jump out of place and ride over the teeth, whereas, if they are set too close they will ride the film, causing creasing, especially on the lower sprocket which acts as a brake on the friction take-up. The small lock nuts on all idler adjusting screws should always be kept tight.

Failure to observe this rule will allow the idlers to drop, not only caus-



ing creasing but otherwise weakening and permanently marking the film.

It has been found that the safest distance to set an idler from a sprocket is the thickness of two pieces of film. Some manufacturers recommend the thickness of one piece of film but this is insufficient as the distance between the sprocket and idler is too small to allow the average splice free passage.

When the idlers are properly adjusted, it should be possible to move any idler from side to side without danger of touching the sprocket teeth. Badly worn idlers mark the film and should be replaced immediately.

#### Intermittent Film Guide

The intermittent film guide is for the purpose of holding the film snugly against the intermittent sprocket but otherwise has nothing to do with the

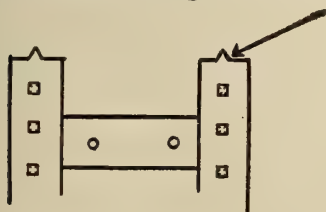


FIG. 9. The arrow shows where the teeth have been grooved to a knife-like sharpness by coming in contact with the wall of the film guide. This will ruin film.

steadiness of the picture. Filing the openings in the film guide holders is sometimes necessary to insure the proper amount of side clearance for the sprocket teeth. Moving the film guide from side to side while the projector is running will determine whether or not the teeth have sufficient clearance. Figure 9 shows the results of the wearing of the teeth against the wall of the guide, thereby developing sharp edges which cut into the film.

There is a right and a wrong way to install this film guide in the holder. Figure 10 shows the proper installation—pointed end down. If in the



## AUTOMATIC REFLECTOR ARC LAMPS

*Silently, Automatically  
Producing—Crisp  
White Light*

FOR SALE BY INDEPENDENT SUPPLY DEALERS

**The Strong Electric Corporation**

2501 LaGrange St., Toledo, Ohio



Send For  
Bulletin 119

*The HEART of Your Sound Equipment*

## VISITRON

Type "A" Photoelectric Cells

HIGHER SENSITIVITY—lower fader settings —  
BETTER REPRODUCTION

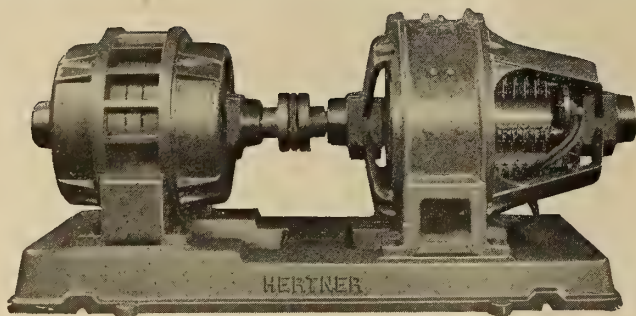
LONGER LIFE—fewer replacements—less servicing  
—ECONOMY

**GM LABORATORIES INC**

1803 GRACE ST.

CHICAGO, U. S. A.





## SOUND IS NO LONGER A NOVELTY

Remember—the Public still uses  
its Eyes at a Picture Show.

Screen flicker . . . light variation, needlessly as  
well as silently, drive Patrons to other types  
of amusement.

Why not look into the TRANSVERTER and its  
kindred equipment?

Thousands of theatres know how well it has im-  
proved their projection.

Smooth—Constant—Economical—quiet in opera-  
tion—its presence in your projection room is in-  
stantly recognized—wherever installed.



If you show pictures, you need the  
TRANSVERTER. Ask your Supply  
Dealer or us for further details WHY.

Canadian  
Distributors

Perkins  
Electric  
Ltd.

### THE HERTNER ELECTRIC COMPANY

**Transverter**

Exclusive Manufacturers of the Transverter

12688 Elmwood Avenue

Cleveland, Ohio, U. S. A.

reverse position as in Figure 11 the pointed end will present a shoulder to the film against which all splices must strike. This strain is so great as to cause torn perforations or even a break in the film especially if the splices are stiff, thick or buckled.

Many projectionists have found it advisable to substitute a slightly lighter film guide holder spring for the stiff one now furnished by the manufacturers. By this small change, less strain is put on the film at this point, with absolutely no change in screen results, wide and stiff splices, especially, going through with greatly decreased resistance thereby lessening the chance of film breakage due to the yielding of the film guide.

One of the main reasons for picture unsteadiness is an excessive amount of play between the moving parts of the intermittent movement,

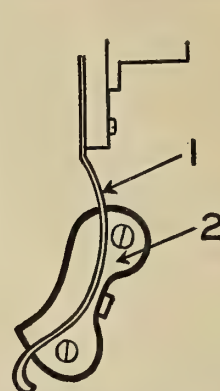


FIG. 10. This is the correct position for the film guide. Arrow 1 shows the guide holder and 2 is the film guide.

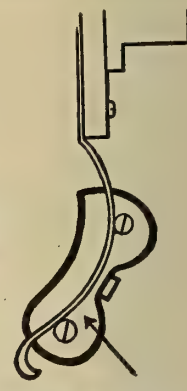


FIG. 11. Here the film guide is upside down allowing the film to strike the sharp end of the guide. Stiff splices won't last under these conditions.

due to wear. Readjustment is made by means of an eccentric bearing but care must be taken to see that it is not set too tightly, otherwise the parts will bind. Projector models using an eccentric bearing at each end of the intermittent shaft should be checked carefully after an adjustment has been made, to see that both bearings are lined up correctly, otherwise the intermittent sprocket will run out of true, resulting in the breaking out of the perforation on one side of the film.

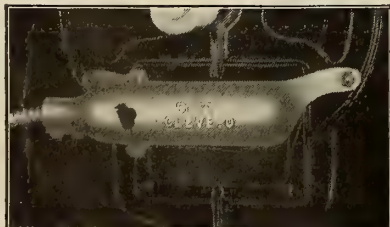
Some projectors provide for a side adjustment of the intermittent shaft by means of a collar and set-screw. Proper alignment is necessary to insure against the intermittent sprocket striking the film perforation off-center.

Excessive wear of the pin-cross type of intermittent movement results in flat sides on the pines, thereby causing a slightly quickened pull-down which gives an added strain on the film perforation. On newer models these pins are equipped with rollers insuring smoother operation.

**Proper Alignment of Upper Magazine**

One widely used projection machine has an adjustment on the top maga-

## “BEST” Magazine Light



Price \$3.50 at your dealers

attaches to side of magazine illuminating the inside showing the exact amount of film on reel from either side without opening door.

**BEST DEVICES CO.**  
200 FILM BLDG., CLEVELAND, O.



zine which allows for its proper alignment. Unless great care is taken to see that the magazine is in line, the film coming from the value rollers will not feed squarely under the idle roller. This generally causes fractured film to crack from the perforations to the edge of the film.

This improper alignment also causes film breaks resulting from film with nicked edges and from loose splices coming in direct contact with the side of the valve.

#### Size of Idler Rollers

The idler roller on the same machine mentioned above is  $\frac{1}{2}$  inch diameter and causes the film to make

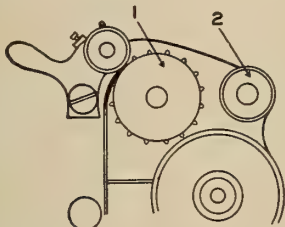


FIG. 12. Shows 1 the feed sprocket and the small roller 2.

a sharp turn on itself. On a roller of this size film which has been dried out and thus has become brittle may break especially if there is an improper amount of tension on the feed roll.

If trouble of this nature is encountered the substitution of a large roller, preferably the diameter of a sprocket, namely  $15/16$  inches, is a practical remedy. This means but a small amount of work, as only a simple extension is necessary to allow the proper amount of clearance and it will be found to be well worth

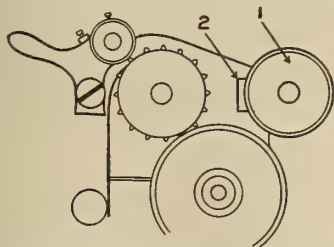


FIG. 13. Here a  $15/16$ " idler replaced the smaller one shown in Fig. 12. The bar, 2, is the only other alteration necessary. The larger idler makes the film last longer.

while. Figures 12 and 13 illustrate the  $\frac{1}{2}$  inch roller and how the large idler roller can be installed in its place.

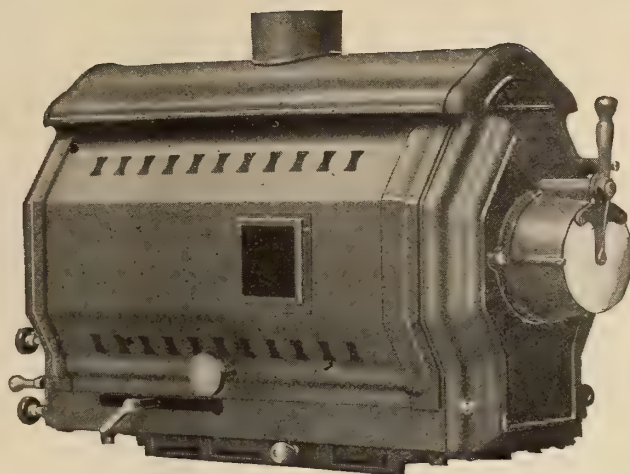
#### Proper Reels

Bent reels and reels with loose and sharp edged flanges should be discarded immediately. Figure 7 plainly shows what happens to the film when such reels are used.

#### Framing

In framing a picture, it is common practice to move the framing lever very quickly. Figure 14 shows what happens to the film when the framing lever is given a sharp, downward blow on a projector where the com-

(Continued on page 43)



## Increase your light *Economically* with **BRENKERT**

### LOW INTENSITY REFLECTOR LAMPS

**I**N stride with the progress of the industry these expertly designed lamps fully meet modern requirements.

Producing the utmost increased light on the screen, the new Brenkert low intensity reflector lamps also incorporate exclusive features assuring ease of operation and uninterrupted service.

See one today at your nearest progressive dealer's. Write for latest complete catalogues

#### BRENKERT LIGHT PROJECTION COMPANY

Engineers and Manufacturers

St. Aubin at East Grand Boulevard

DETROIT, MICH.

## WIDE FILM PROJECTION

Requires

## S. O. G. GRAND SPECIAL CONDENSER SYSTEM

Parabolic cylindrical curves create more light and produce an oval spot  
Also adaptable to Standard Film Projection with slight changes

### FISH-SCHURMAN CORPORATION

45 West 45th St.  
New York

6364 Santa Monica Blvd.  
Hollywood, Cal.



## Good Projection Requires Good Rectification



M. P. 25-25

### Good Rectification Means FOREST RECTIFIERS

**T**HIS Forest Rectifier meets the demand for a single unit to supply direct current for two projectors, and will furnish 15 to 25 amperes to either projector continuously.

It supplies a steady direct current, free from pulsations, and will produce a better light than other current supply devices. The only wearing parts are the bulbs which will last at least one thousand hours and usually much longer since only two bulbs are being used at a time (except during change over) and the load is alternately carried first by one set of two tubes then the other two as the projectors are alternately used.

This Forest Rectifier embodies the use of four rectifier tubes which are connected to supply current to two direct current circuits independent of each other thus preventing loss of current at the first arc when the second arc is struck.

Both arcs can be operated at the same time during the change over period and there will be no diminishing of the light from one projector while lighting up the second.

Two Ammeters are mounted on the unit which will show at a glance the amperage being used at either arc.

Links are provided for operating from 110-220 or 240 volts.

Rectifiers for all purposes made in 15 amp., 25-25 amps., 30, and 65 amps. sizes.

*We are specialists in our field. Send us your technical problems. Literature on request.*

## FOREST ELECTRIC CORP.

New and Wilsey Sts.

Newark,

N. J.

## Wide Film Cinematography

By Arthur Edeson

*Of particular interest to projectionists is the following abstract of an article contributed by Mr. Edeson to a recent issue of American Cinematographer. Mr. Edeson discloses the fact that he is a "convert" to wide film, particularly to the 70 mm. size, almost wholly as a result of his actual production work on the process and his subsequent impressions upon seeing the completed picture. Mr. Edeson's comment is a valuable addition to motion picture technical information, comprising as it does the first authentic data on the technical aspects of wide film production. There is much of value to the projectionist in this article.—The Editor.*

**I**F anyone had, a few months ago, told me that I would not only be photographing a big picture on wide film, but also rabidly enthusiastic over its artistic possibilities, I would have thought him crazy. For I had the typical, conservative cameraman's attitude toward wide film: it might be all right as a novelty, but as a practical medium for serious artistic work it was impossible. I could think of too many technical and artistic flaws in it to ever think that it could gain a cameraman's favor. Everything—especially the new proportion of its picture—seemed absolutely wrong.

Seventy millimeter photography has given me an entirely new perspective. Instead of regarding things in the light of the old, cramped, Movietone frame, I now see them, photographically, as my eye naturally perceives them—in much the same proportions as the low, wide Grandeur frame.

Technically, 70 millimeter cinematography is much the same as ordinary 35 mm. cinematography. The cameras are standard Mitchell cameras. The film is standard Eastman Type Two Panchromatic. The lenses are, in most respects, similar to standard lenses.

### WINNIPEG, CANADA

**J. M. RICE & CO., J. M. Rice, Prop.** Leading equipment dealers in all kinds of projection room equipment facilities. Representatives of leading equipment manufacturers of the United States and Canada. All our merchandise guaranteed for performance and stability. Whatever you want, we will supply it.

It is in the lenses, however, that the chief technical difference is found, for any given lens will embrace a considerably wider angle of view on the 70 mm. film than on the smaller standard. Therefore, when, as in this present picture, two versions are to be shot, the 70 millimeter camera must use a lens of approximately double the focal length of the lens used to make a corresponding 35 mm. shot. Or, reversing the example, when the cameraman uses a lens of a given focal length, the standard cameraman must use a lens of approximately half that size to make his corresponding shot. The shortest focal-length lens that I used during the making of "The Big Trail" was 50 mm., although 40 mm. is claimed to be theoretically the absolute minimum useable. However, as this was actual production work, and not laboratory tests, I preferred to play safe, and never used anything below a fifty. When I used a fifty on a shot, the standard cameraman would use a twenty-five to produce a corresponding shot on his smaller film; when his shot required a fifty, mine would demand a four inch, and so on. In this picture, though the majority of the scenes were duplicated shot for shot, in each size of film (as nearly as was possible), the Grandeur version, being considered the most important, received the greater attention. So it was the requirements of the 70 millimeter cameras that dictated the lenses to be used, the set-ups, action, and all such matters.

The selection of lenses for 70 millimeter use is especially important. One of the chief photographic complaints against wide-film has been that there was only too often a marked falling off in definition at the extremities of the picture. The only cure for this is the use of lenses of the very highest quality—the very best of the best. Of course, any cameraman worthy of the name will take great pains in the selection of his lens equipment, but in selecting wide-film objectives, he must take even more extraordinary precautions. This naturally means an endless amount of testing before even one lens is chosen, but it is well worth it for only the best lenses can give perfect Grandeur pictures, and only perfect pictures can reveal the full possibilities of 70 mm.

The chief requirements for lenses for wide-film cinematography are,

## GRIFFIN FILM CEMENT

Makes a non-buckling patch that stays stuck

Specially Suited for Sound Prints

Manufactured by

**F. B. GRIFFIN, - - - Oshkosh, Wis.**

FREE SAMPLE and PRICES on request



first and foremost, extremely wide covering power; and secondly (and of quite as great importance), extremely great depth of focus. Due to the more natural shape of the Grandeur frame, there is a certain pseudo-stereoscopic effect produced: but this effect is lost unless there is a very considerable depth of focus in the image.

#### Pseudo-Stereoscopic Effects

The 70 millimeter picture is very nearly the same proportion as the natural field of our vision, which, I suppose, is responsible for this pseudo-stereoscopy. But, clearly, to take full advantage of this, we must use lenses which will give us a degree of depth at least somewhat approximating that of our eyes. Therefore, it is vital that Grandeur lenses be selected with a view toward getting this effect, so that the crispest, deepest pictures may be had.

Another point which has been a source of trouble to the early users of wide film is its liability to abrasion. During the many months we were working on "The Big Trail," we shot more than half a million feet of 70 mm. alone, with absolute freedom from scratches or abrasions of any kind. This was done merely by exercising extreme care in the always important matter of keeping the cameras and magazines clean. It became a hard and fast rule that the cameras *must* be cleaned thoroughly every night, not only with brushes, but with compressed air streams. And, since we were working under all sorts of conditions on the various locations which we pioneered—in the insufferable heat, humidity, and dust of the Arizona deserts; the damp cold of the Montana and Wyoming mountains; and the dank dustiness of the northern forests—without any trouble from this source, it would seem that only such care is necessary as a preventive.

#### Film Curling and Buckling

Another troublesome detail for which we found care a sure cure is that of film curling and buckling. A buckle in a 70 millimeter camera is a terrible thing, for it not only ruins a large quantity of valuable film, and often damages the camera, but it invariably makes the motor a total loss. During our first week's work on the picture, we had several bad buckles—which meant new motors every time. Naturally this was serious; it couldn't be allowed to continue. So we bent all our energies toward finding the cause of these buckles. Eventually we found it to be caused by friction between the edges of the film and the walls of the magazines. After that, we took special pains in loading, making sure that every roll of film used was absolutely true to its spool, with no chance of touching the walls of the magazine—and we had no more buckles during the picture.

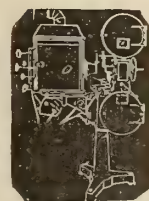
From the artistic viewpoint, the chief requirement of Grandeur cine-

matography is that both the cameraman and the director learn to accommodate themselves to the wider frame. The cameraman's problem is probably the easier, for he soon learns that composing a picture on the wide frame of the Grandeur camera is not, essentially, so different from composing for the old "silent standard" rectangle, and far easier than for the nearly square Movietone frame. If a man is enough of an artist to successfully compose his cinematic pictures for the earlier formats, he should be able to accommodate himself to this new one, just as a good painter can adapt himself to the requirements of his usual canvas, or of great mural panels.

The director, however, must in a Grandeur picture pay considerably more attention to his background action than is usually the case, for, even in close-ups, the depth of focus demanded by Grandeur makes the background an important part of the picture. Incidentally, Grandeur reduces the number of close-ups considerably, as the figures are so much larger that semi-close-ups are usually all that is needed.

In working on such a picture as "The Big Trail," 70 millimeter is a tremendously important aid, for the epic sweep of the picture demands that it be painted against a great canvas. Grandeur gives us such a canvas to work with, and enables us to make the background play its part in the picture, just as it did in the historical events which we are dramatizing. And that is what we have tried to do throughout this picture:

(Continued on next page)



#### Theatre Equipment NEW AND USED

Most complete stock in the U. S. Moving Picture Machines, Screens, Booths, Opera Chairs. Spotlights, Stereopticons, Film Cabinets, Portable Projectors, M. P. Cameras, Generator Sets, Reflecting Arc Lamps, Carbons, Tickets, Mazda Lamps and Supplies.

Projection Machines repaired and overhauled. Repair parts for all makes opera chairs. Attractive 3 x 10 ft. muslin banners, \$1.50; on paper, 50 cents.

We Pay Highest Prices for Used Projection Machines, Opera Chairs, etc. Everything for the Theatre—Write for Catalog K. Movie Supply Co., 844 Wabash Ave., Chicago

## THE BIOSCOPE

The Leading Journal of the British  
Cinematograph Industry

20th Year of Weekly Publication

Contains a complete section each week for the special benefit of Projectionists.

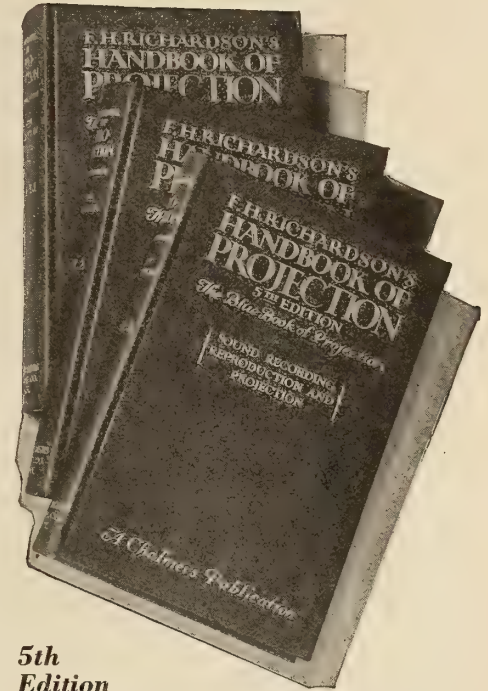
Cash prizes awarded for original ideas published. Specimen copies 18 cents.

Annual Subscription 7 dollars 50

THE BIOSCOPE PUBLISHING CO., Ltd.  
8-10 Charing Cross Road, London, W. C. Eng.

## An Ideal Xmas Present

## The Most Famous PROJECTION BOOKS In the World



5th  
Edition

## HANDBOOK OF PROJECTION

By F. H. Richardson

Back in 1910 Mr. Richardson wrote the first Handbook of Projection. It was a sell out. Second, third and fourth editions, each bigger and more successful have followed. The present fifth edition in three separate volumes, illustrated above, is the culmination of years of intensive effort.

Richardson is no swivel chair author. He knows the problems of the field—meets the men on their own ground. His books reflect a practical knowledge of just what information is needed. Recently he completed a 17,000 mile trip through the U. S. and Canada in the interests of projection.

#### CONTENTS

Volumes I and II are devoted entirely to the general subject of projection and everything related to it. Volume III deals exclusively with sound projection. All three volumes are profusely illustrated and contain over 1,400 pages of projection information written so you can understand it clearly. Each volume contains Richardson's famous question and answer index giving immediate access to hundreds of different problems.

These are the books which are being used by projectionists and theatre managers all over the world to secure improved results.

Send for this finest of projection  
libraries today.

USE COUPON TO ORDER

CHALMERS PUB. CO. (M)  
516 Fifth Avenue, New York, N. Y.

Enclosed find (check) (money order) for \$10.25. Send Richardson's 3 volume Handbook of Projection to .....



to make history live again upon the screen. The chief motif of the story is the indomitable perseverance of the pioneers, as shown in their pushing west across the great deserts, the vast plains, the towering mountains, and into the great forests of California and Oregon. The background thus plays a vitally important role in the picture—a role which can only be brought out completely by being shown as 70 millimeter film can show it. Lucien Andriot, who photographed the standard-film version of the picture, did a superb piece of work, but the medium with which he was working could not begin to capture the vast sweep of the story and its background as did the *Grandeur*. Working in 35 mm. film, he was simply unable to dramatize the backgrounds as did the larger film, for in 35 mm. he could not attempt to adequately show both the vast backgrounds and the intimate foreground action in a single shot as the *Grandeur* cameras can. The illustrations reproducing the identical scene as treated by both 35 mm. and *Grandeur* cameras shows this admirably.

#### Wide Film Best Medium

From my experience with 70 millimeter cinematography on "The Big Trail," I can confidently say that the wider film is not only the coming medium for such great pictures, but that it will undoubtedly become the favored one for all types of picture. It marks a definite advance in motion

picture technique, and from it will undoubtedly be evolved the truly stereoscopic picture of the future, toward which so many people have long been striving.

As I have worked, so far, only with the 70 mm. film, I hardly feel qualified to prophesy as to the width which the industry will ultimately adopt as the standard, although I naturally lean toward the *Grandeur*, with which I am most accustomed. However, wider film is so definitely a desirable improvement that I hope that a definite standard will soon be accepted. Once that standard has been determined, the public will, if given suitable pictures on the wider film, undoubtedly show a decided preference for it. None the less, 35 mm. versions must continue to be made for a long time; but this will not be overly difficult, as reductions can be made from *Grandeur* negatives with perfect satisfaction, by optical printing, and at a far less expense than by shooting two versions, as has been done on all the wide-film pictures thus far made. This will, of course, impose upon the cameraman and director a necessity for unusually great care in making his composition: but it will hardly be more difficult than his present problem of composing 35 mm. pictures so that they will be suitable for all of the many projection-apertures in use throughout the world. The greatest difficulty here will be in composing his two-shots, which will have to be made so that

they can be, in the reduction-print, made into two separate close-ups.

But this difficulty is only a minor one when compared with the very great advantages which 70 millimeter cinematography offers in all other respects. And when these advantages, and those which the wide film soundtrack offers the sound-engineers, are combined with a perfected system of color cinematography, cinematographers and directors will indeed have a medium which is worthy of their best artistic and technical efforts.

#### S. M. P. E. Chicago Section

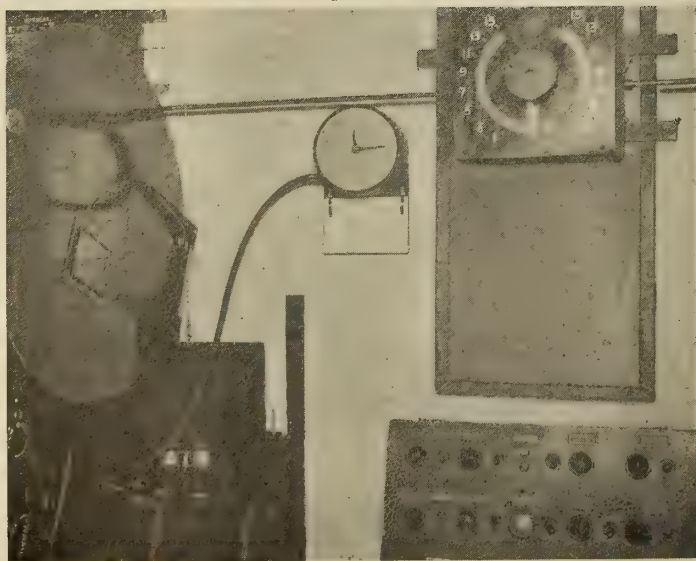
The Chicago section of the Society of Motion Picture Engineers has completed plans for regular meetings to be held on the first Thursday of each month. The next meeting will be held on November 6, at the Webster Hotel. For the December 4th meeting it is planned to visit the Enterprise Optical Company and hear a paper by O. F. Spahr on Projection.

On January 8, 1931, a paper will be read before the Society by R. Fawn Mitchell of Bell & Howell Company on Color.

#### S. M. P. E. New Headquarters

The Society of Motion Picture Engineers has leased Room 701 in the building at 33 West 42nd Street for its New York Headquarters. Headquarters will be in charge of Silvan Harris who has just been appointed Editor-Manager by the Board of Governors of the Society.

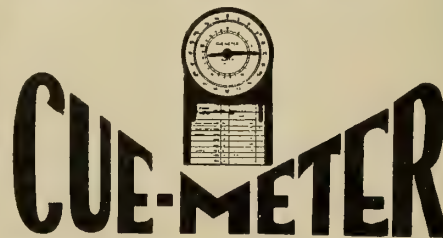
# IMPOSSIBLE ..



## YET IT WAS DONE.

To demonstrate the accuracy and dependability of the Cue-meter an entire performance was put on in one of the largest theatres on the Pacific Coast WITH ALL OBSERVATION PORTS CLOSED thereby making it impossible for the projectionists to see the screen.

Even with this unheard of handicap the fading cueing and change-overs were perfect. This procedure is not recommended but it definitely illustrates the accuracy of the Cue-meter.



Ask your dealer or write for further information

**THEATRE ENGINEERING SERVICE COMPANY**  
1442 Beachwood Drive Hollywood, California

DON'T GUESS . . . USE CUE-METERS



## Film Mutilation

(Continued from page 39)

plete carriage moves as one unit. Figure 15 shows the same damaging result on a model on which the intermittent sprocket *only* moves in synchronism with the framing lever.

### Film Loops

Excessively large upper or lower loops either cause a rattle in the film guard above or allow the film to drag

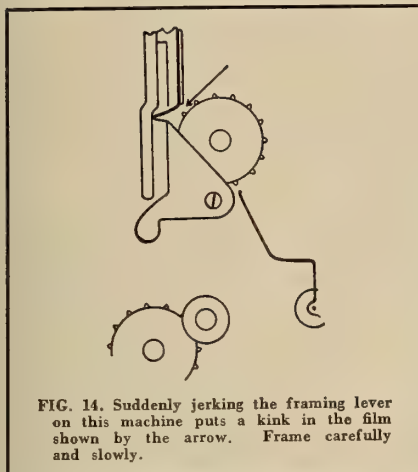


FIG. 14. Suddenly jerking the framing lever on this machine puts a kink in the film shown by the arrow. Frame carefully and slowly.

in any oil which may be present below. The film also has a tendency to jump the sprockets, which can take place if the idlers are set too far from the sprockets.

The practice of resetting loops while the projector is running should be discouraged as in many cases the sprocket teeth strike outside of the perforations, or otherwise damage the film.

### Film Tracks or Trap Shoes

Many scratches are caused by worn film tracks, or trap-shoes as they are

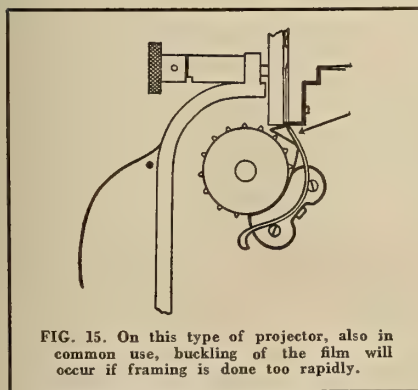


FIG. 15. On this type of projector, also in common use, buckling of the film will occur if framing is done too rapidly.

known on one of the projectors, allowing the face of the film to scrape against the recessed aperture plate.

Such tracks or trap-shoes together with all tension shoes or door pads that show a "wavy" or badly worn-down surface, should be replaced by new ones.

### Fire or Valve Rollers

The valve rollers of both magazines should always be kept clean. (Continued on page 45)

# The Public Wants Color

*These positive films supply it,  
through beautiful, over-all tints—  
at black-and-white cost*

THE public's appetite for color has been whetted. Colored pictures are the cream of the show.

With Sonochrome Tinted Positive Films any picture can be made in delicate, atmospheric, over-all tints that help to express every turn of the plot....to bring out the prevailing mood of the picture. And this color costs nothing extra....for the Sonochrome price is the same as that of ordinary, black-and-white positive.

Sonochrome reproduces sound faithfully....of course. It's designed particularly with that requirement in mind.

**EASTMAN KODAK COMPANY**  
ROCHESTER, NEW YORK

**J. E. Brulatour, Inc., Distributors**  
New York Chicago Hollywood

## Care of Batteries

It is essential that storage batteries receive attention at regular intervals. The most important item in the care of a battery is that of adding pure distilled water. A sufficient quantity of water should be placed in each cell to bring the surface of the liquid from one-quarter to one-half inch above the tops of the plates. Some have endeavored to set regular intervals for adding water to battery cells, but it is almost impossible, as every theatre is operating under different conditions.

Distilled water for batteries should be kept in a glass bottle and not in a

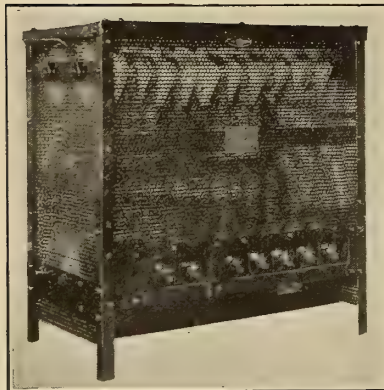
metal can. Care should be used when testing not to spill *electrolyte* on top of the battery, as it will cause corrosion at the terminals and partial short-circuiting of the cells, which will cause a hissing and frying noise in the reproduction. Constant charging and discharging and also room temperature causes some of the water contained in the electrolyte to evaporate, and if the lost water is not replaced, the level of the electrolyte will drop below the level of the plates, which may injure them.

When inspecting the battery to see whether or not it contains enough electrolyte, never hold a lighted match over the vent holes of the cells,



# Hoffmann-Soons

## PERFECTION



Projectionists and owners from ocean to ocean recognize the final economy of installing Perfection Rheostats.

The only Union-Made Rheostats—supreme in the picture world.

Sold by all branches of the National Theatre Supply Co., Sam Kaplan, New York; Continental Theatre Accessories, and by your dealer.

### HOFFMANN-SOONS

Electrical and Engineering Corporation  
387 First Avenue Mfg. Division New York  
Contracting Electrical Engineers—Moving Picture  
Theatre Electrical Specialists

# RHEOSTATS

## Your Preference, Please!

THE editors of THE MOTION PICTURE PROJECTIONIST solicit your aid to the end that this publication may be of the maximum service to you. Every subscriber can do his bit to improve this service by using the space provided below to indicate his preference for special articles and other material in which he may be particularly interested.

Let us know your preference, please. All requests will receive attention in the order of their receipt, so act quickly. Use the blank below to tell us in just what subject you are particularly interested. Do it now!

Editor,  
M. P. PROJECTIONIST:

I am interested in the following subjects, on which I should like to see information in THE MOTION PICTURE PROJECTIONIST:

1. ....
2. ....
3. ....
4. ....

NAME .....

ADDRESS .....

## Opinions on New Standard Release Print

(Continued from page 31)

the black spots were not used, or if so, they are not in the proper place for those who ran this picture.

### How About Shorts?

There are many projectionists who dislike turning down machines after they are threaded to a specified number of turns, and as some reels run very small (Part 8 of "Bride of the Regiment," 296 ft., Disc.), they do not always have time for this. Then again, the article makes me think of features only: Now, how about making change overs on short subjects? Nothing is said about this and a good projectionist certainly wants to make these perfect also. Some reels have a large amount of music, while the end shows on the screen; others have none. Movietone usually has some notes of music abruptly cut off on the end by the insertion of the license number, which also is very objectionable.

If they insist on using these spots, why not use one instead of four, as the alert projectionist, that you speak of, certainly will be able to see the one, and the duration of the spot will be much shorter.

### Spots Too Large

These spots show in our theatre about a foot and a half in diameter; entirely too large! A suggestion would be to put these spots in either the extreme lower left hand or right hand corner, as they would not be so pronounced there; and make them much smaller, say, one-third the size.

I would also like to say that if some of these gentlemen, whose names were mentioned in the article, would work in a projection room with projectionists, not on Broadway, they would find matters somewhat different, as these boys run continuous shows and change them every few days, and have to contend with all sorts of obstacles.—William E. Cox.

Willimantic, Conn.

Editor, Motion Picture Projectionist.

Sir: The copy of the standard release print was received from the Projection Advisory Council and arrived just in time to be read at our regular meeting. This new print looks to be the answer to incorrect cue sheets and cues lost through continued doubling up of reels. This Local Union will gladly cooperate with the Council to make this print plan a success.—O. S. Fairbanks, Secretary L. U. 453.

Warrenton, Missouri

Editor, M. P. Projectionist.

Sir: You asked for comment on the new standard print. I believe that this is a great improvement, and that it will eliminate the scratches and dots at the end of the film. I believe that the footage numbers, on the start of Reel I, should be eliminated. While the light is on, unless the dowser is down these show on the screen. It is hard to tell when to throw the dowser up. This is the only thing I find to be wrong with standard print.—R. P. Haveland.



## Film Mutilation

(Continued from page 43)

Care should be taken to see that they revolve freely as a sticking roller can cause bad emulsion scratches especially if it is worn, thereby allowing the center of the roller to come in direct contact with the face of the film. This is especially true of the upper magazine rollers around with dirt and small pieces of film very often accumulate.

### Adjustment of Film Trap Door

On one make of projection machine the film trap door is designed so that it can be easily removed by merely lifting it from its holder. In replacing this film trap door care should be taken to see that it is seated properly, as unless this is done one is liable to ruin the intermittent sprocket, bend the shaft as well as ruin the film which happens to be running through the projector at the time.

### Strippers on Sprockets

On some projectors, so-called strippers or stripping plates are provided to prevent, by any chance, the film from winding around or "following" the sprockets as well as to remove any accumulation of dirt that may tend to form at either side of the sprocket teeth. In resetting these strippers after the replacement of sprockets, extreme care must be taken to see that they do not come in contact with the teeth as this will cause the teeth to wear to a sharp edge which will damage any film coming in contact with it.

### Unnecessary Oiling

Flooding the mechanism with oil is unnecessary and causes oil to get on the film. Dust then adheres to the film making good clear projection impossible. This practice also is a fire hazard as oily film will catch fire a great deal easier than that which is clean. Aside from the intermittent case, one drop of good oil in each oil hole will be sufficient for the average day's run.

### Tracing Film Damage

Film damage can sometimes be more easily traced if it will be remembered that certain projectors run the film emulsion or dull side against all three sprockets, while on others the support or shiny side, only touches the sprockets. For example; if film is received showing tooth marks on the emulsion side, it is fairly simple to determine on what make or makes of projectors this film has been run, especially if the investigator has familiarized himself with the different types of sprocket teeth.

### Film Should Be Waxed

In making the new films attention is drawn to the desirability of waxing new prints along the perforations



## HIGH INTENSITY SPOTLIGHT

**MORE AND BETTER  
STAGE LIGHTING AT  
LESS EXPENDITURE OF  
ELECTRICAL ENERGY.**

**MOST REMARKABLE  
RESULTS ON LARGE  
STAGE SETS.**

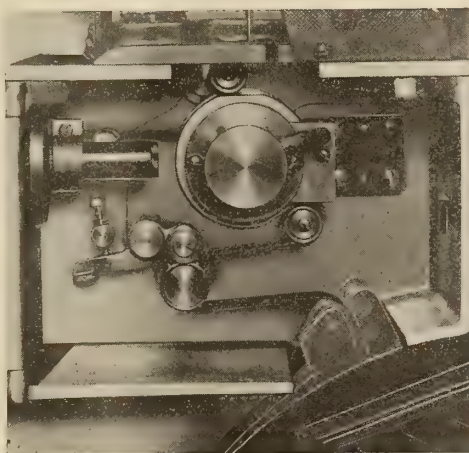
**HALL & CONNOLLY, INC.**

24 Vandam St.

New York, N. Y.



# SYNCRIFILM



Sound Head for Simplex

is not claimed to be the best sound equipment in the world.

We do not know who makes the best.

We do know that your patrons will be pleased with the sound in your theatre if equipped with

## SYNCRIFILM

**Simplicity of Design.  
Trouble-proof  
operation.**

**Easy to install and Low Cost are SYNCRIFILM Features.  
Can easily be fitted to your present disc equipment.**

## WEBER MACHINE CORP.

*Pioneers in the sound field*

59 RUTTER ST.

ROCHESTER, NEW YORK

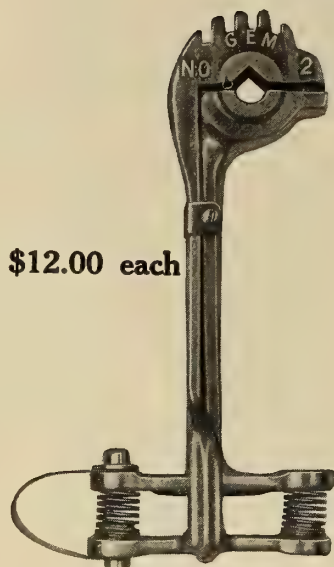
Export Department  
15 Lighthouse St., N. Y. C.

Cable Address  
"ARLAB" New York



Save Money by Using the

**GEM**



\$12.00 each

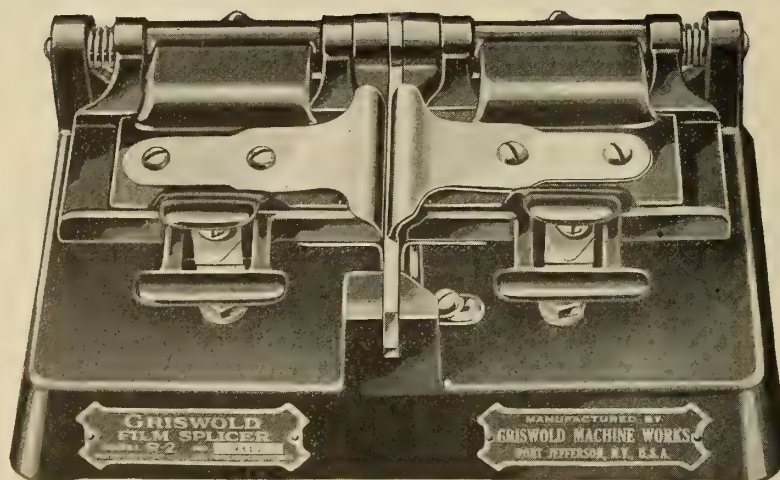
**H**ERE'S an opportunity to save money on your positive carbon jaw replacements. Note its unique design. Note the arrangement of upper and lower jaws, which compels the contact on the carbon to be constant, thereby reducing pitting and arcing to a minimum. Don't wait until your present jaw gives out, find out NOW about this unique device, or better yet order a spare now.

**FOGELBERG ENGINEERING CO.**

128 S. Clinton St.

Chicago, Ill.

*Sold by Reliable Independent Dealers Everywhere*



15,000 Griswold Film Splicers are in constant use daily in theatres throughout the World. The standard film splicer for efficiency, durability and economy.

**GRISWOLD MACHINE WORKS**

Port Jefferson, L. I.

New York

**\$2.00**

*Subscribe Now*

**\$3.00**

**One Year MOTION PICTURE PROJECTIONIST Two Years**

to prevent unsteadiness and premature breakdown.

In making the light sensitive emulsion of motion picture film one of the chief ingredients is gelatin—a substance which readily absorbs and gives off moisture. In freshly developed film the gelatin contains a considerably higher percentage of moisture than is found in seasoned film, and when in this condition it is easily affected by heat, tending to make it soft and tacky particularly in a moist atmosphere. The first point at which new film comes in contact with unusual temperature is at the aperture plate of the projector where the light is concentrated, producing heat to a degree which softens the gelatin and causes it to collect on the tension springs or shoes where it rapidly dries and forms a flint-like deposit. As the new film is projected, the hardened deposit of gelatin continues to accumulate and offers further resistance causing scratches along the perforations. As the resistance increases there is the added danger of the teeth of the intermittent sprocket tearing and damaging the perforations, sometimes to an extent where injury to the print is irreparable.

#### Careful Waxing Essential

Careful waxing produces, under the action of heat, a smooth and polished surface on the gelatin along the perforations; provides against undue straining during the first projections of new prints; materially benefits successive runs, and greatly prolongs the commercial life of the prints.

Cold wax should never be used as it is impossible to apply it evenly. There is also the danger with the cold method of over-waxing with the result that, in contact with the heated pressure springs, the wax melts and spreads over the picture. A very slight application is all that is necessary and is best accomplished by a waxing machine which deposits a thin layer of hot wax along the perforations. New prints treated in this manner require no further waxing.

#### Listening In On Condenser Paper Imperfections

The long strips of paper tissue that go into the making of a filter or bypass condenser must be relatively free from metallic or foreign particles. Every speck of conducting material imbedded in the tissue is a potential source of trouble, since the electrical charge in the condenser concentrates its full force on the weak spots in the long dielectric that separates the two conducting tinfoil plates. Unfortunately, however, the troublesome specks are usually too small to be detected by the naked eye, and thereby hangs the following tale.

Such troublesome specks can be seen by means of a high-power micro-



scope, appearing very much like lumps of coal. Other specks are absolutely invisible, irrespective of magnification. There are, however, two positive methods of detecting and counting the metallic particles per unit area of condenser tissue, which have been developed by the Dubilier condenser specialists.

#### Two Testing Methods

The first method is a chemical one, in which the tissue is chemically treated so as to bring out the metallic specks in the form of large discoloration spots readily visible to the eye. This method, however, renders the tissue unfit for use, although it serves as a representative test of an entire lot of tissue. This method detects only metallic particles.

The second method is a "listening-in" process and does not render the tissue unfit for use, so that the tissue actually used in a condenser may be tested for weak spots. Briefly, the condenser tissue roll is placed in a device which comprises winding and unwinding rolls and contact members. In passing from one roll to another, the paper tissue passes between two brass contact rolls in circuit with a direct current source and a pair of head-phones. The pressure between the contact rolls may be adjusted. The operator, slowly turning the winding crank, listens by means of the head-phones to the clicks caused by metallic or conducting specks, and determines the number per unit area, which must fall below the tolerance set for that grade of tissue. A further development is an automatic counter which keeps score of the number of electrical weak spots per unit area of the tissue being inspected.

#### Perfection Impossible

And so another gamble is eliminated in the delicate process of making reliable filter and by-pass condensers. While it is physically impossible to obtain a paper tissue that is absolutely free from conducting particles, the condenser specialists set a minimum of such weak spots per unit area, and depend upon a plurality of condenser tissue layers or "papers" to provide the highest possible dielectric strength at every point throughout the length of the paper condenser winding.

#### Projector Extinguisher

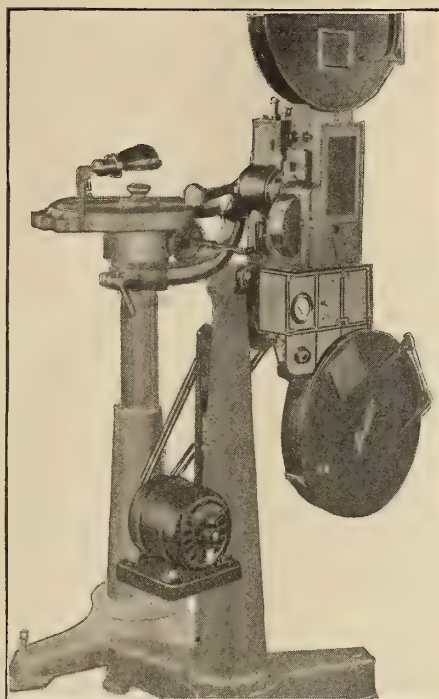
The Pyrene Manufacturing Co. of Newark, N. J., is distributing an attachment for projectors which serves as an automatic fire extinguisher and electric cut-off. The device consists of one quart capacity filled with Pyrene fire extinguishing fluid, a gas pressure cartridge chamber, electric switchbox, several feet of copper tubing, a recharge holder containing extra gas cartridges, fuse bands and accelerating floss.

The device has been approved by the Underwriters Laboratories.

## MELLAPHONE EQUIPMENT

*Offers Full Patent Protection to Exhibitors*

### UNDER FULL TONE REPRODUCTION COMPANY PATENTS



## Mellaphone Sound on Film

Advanced mechanically, and embodying the latest units of best known manufacturers in the sound field. Finest Photo Electric Cells. All aluminum filmheads, uses no chains. Latest Samson Head Amplifiers. 1/4 H. P. motors. Finest Optical System attainable. Gleason gears.

## Mellaphone Turn Tables

Steady and vibrationless operation, balanced flywheels, Gleason gears, ball bearing throughout. Resynchronizer. Spring Suspended Filter. Audak or Electrical Research Lab. Pick-ups. Leveling pedestal screws. Guard, lamps, and needle cups.

*Write or wire for full information. Territory for dealers.*

**MELLAPHONE CORPORATION** Rochester New York

# THE ROSS

F:2-4 PROJECTION LENS

SOLE DISTRIBUTORS:—  
IN U. S. A.

**THE NATIONAL THEATRE SUPPLY CO.**

*(Branches in All Large Cities)*

IN CANADA:

**INSTRUMENTS, Ltd.**

OTTAWA



TORONTO

**Subscribe NOW!—At present low rate of \$2.00 per Year**



## Color Cinematography Today

By W. T. Crespinel

IN considering color as applied to motion pictures, one must conceive the fact that it is here to stay. When sound was introduced, there were many who predicted its early eclipse, yet today no picture is worth considering unless it has a sound accompaniment. The same evolution is taking place with pictures in color. The future seems to suggest that all pictures will be in natural color and it is interesting to note that this same evolution of color is not confined entirely to motion pictures, but to business outside the film industry. Much more attention is paid to Milady's Fashions, house decorating, furniture—even to linen—house painting, and highway advertising posters. Neon signs give us color at night which beautify theatres, business districts, and altogether we can consider that we live in an age of color.

In searching for data on the early attempts to obtain pictures in natural color, we have to look back many years. The impression that color photography belongs to recent times is far from true.

### The Early Art

One of the earliest records shows that in 1860,—seventy years ago—Clerk Maxwell, then of the Royal Institute of London, expounded very definite ideas along this line. Of

course, in those days, even ordinary black and white photography was quite difficult, and those who attempted to make pictures had even to mix their own emulsion and coat their plates before being able to take their negatives. And with this in mind, we can more easily understand and more readily appreciate the difficulties with which these early color workers had to contend. With regard to the attempts by Clerk Maxwell, we find that his results were far from perfect, due to the fact that his negative photographic plates lacked color sensitivity. His negatives were sensitive only to certain colors, particularly to the blue end of the spectrum. His plates were not at all sensitive to the red and green regions of the spectrum, and consequently with this great handicap, he was unable to reproduce true natural colors. However, his theories were correct even if his materials were inadequate.

About ten years later, Louis Ducos du Hauron, a learned Frenchman, published a book on the problems and solutions of color photography. Du Hauron explained in this book the results of his experiments and undoubtedly had a very comprehensive idea of the requirements needed to obtain true color results. It is interesting to note that many of the color processes now on the market (I refer to still photography), were either suggested or outlined by du Hauron.

One especially that has enjoyed a world-wide reputation is the screen plate process:—du Hauron suggested that the surface of a glass plate might be covered by tiny filters of red, green and blue, and a sensitive emulsion be coated on top of these colored grains and the photo made, the minute filters of course passing the colors through in their correct order.

### Vogel's Contribution

About the same time Dr. Herman Vogel of Berlin made an all important discovery. Referring to Clerk Maxwell's work, I mentioned that his negatives lacked color sensitivity, and consequently his results suffered. Dr. Vogel made the discovery that certain dyes added to the emulsion prior to photographing made the negative sensitive to reds and greens. The value of this discovery cannot be underestimated, because it forms the basis of all natural color processes, either for still work or for motion pictures.

With the advent of motion pictures, it was only natural that sooner or later attempts would be made to produce them in colors, and so we find that in 1902—twenty-eight years ago—two Englishmen, Lee and Turner, were ready to place on the market the first natural color motion pictures. Back in those days, the only film available was of the size used by the old Biograph Company, something like three inches by two and one-half. Lee and Turner were therefore forced to use this film. Their process was a three-color one. Apparently they knew nothing of two-color work. Now, as I have said, their method was a three-color one, which meant that they had to photograph three pictures to every ordinary black and white. One through a red filter, one green, and one blue, and therefore their camera, accommodating this very wide film, had to photograph at the rate of 48 pictures a second, which represents 16 red pictures, 16 green, and 16 blue. From the negative a black and white print was made, that is black and white in appearance, but, of course each picture carried latent color values.

In projecting, they had a machine which ran at the same speed as the camera, that is, at the rate of 48 pictures a second. The machine carried a series of transparent color filters placed between the lamphouse and gate, composed of three colors similar to those through which the negative was taken, and in threading the film in the machine, the picture which carried the red records, or latent color values, was placed in front of the red segment of the color filter and the machine was started. So really, what one saw was, first, an image on the screen of the red values, quickly followed by an image of the green, and finally of the blue, and then the red started again followed



## SUPER-LITE LENSES

WISELY CHOSEN BY  
AMERICA'S BEST THEATRES

### NEW BIFOCAL SUPER-LITE LENS F:2.0

A variable focus lens with a wide range of foci for both silent and sound film.

### SERIES III. SUPER-LITE LENS F:2.0

Standard full Half-Size lens furnished in short focus as low as 4" E. F. and up to 10" E. F.

### SERIES IV. SUPER-LITE LENS F:2.0

Full 3" diameter lens to meet the demand for more light for longer throws. 6" E. F. to 10" E. F.

*Quality Guaranteed*

**PROJECTION OPTICS CO., INC.**

330 Lyell Avenue

ROCHESTER, N. Y.

U. S. A.



by the other two colors, and so on, and one received the impression of the picture being in natural colors.

#### Physiological Aspects

But fortunately, not only for Lee and Turner but for everybody concerned with the motion picture industry, nature played an all important part in the illusion. Science has proved that the eyes retain the impression of an image, whether colored or in black and white, for approximately one eighth of a second, and therefore when viewing, say, an ordinary black and white picture, while the pull-down shutter is functioning and the picture is entirely cut off from the screen, the eyes retain the image that has just been cut off from view for the amount of time that it requires for the next picture to appear on the screen, and having still that impression, it coalesces or mingles with the new picture and gives the impression of a continuous picture. And that was precisely what happened with the Lee and Turner color pictures. First the eyes received the red picture, which was quickly mingled with the green and then with the blue. The three combined, and gave the impression of a natural color reproduction of the original object photographed.

The process was never publicly exhibited, the technical difficulties involved foreordaining it to absolute failure. However, everything must have a beginning and credit is therefore due to Lee and Turner for their attempt.

#### The Kinemacolor Process

During the period that Lee and Turner were working on their process another method was born. I refer to Kinemacolor, the invention of George Albert Smith of England. Undoubtedly Mr. Smith had seen the results of the Lee and Turner process and realized that the method was too complicated, for he eliminated one color from his experiments and worked with only two colors, they being red and green, and his results, while not as perfect as the three-color method of Lee and Turner, were remarkably good.

It is strange, that, since 1909, which year saw the inauguration of Kinemacolor, there have been but three prominent color processes, namely, Technicolor, Prizma, and Multicolor.

Technicolor no doubt has had the field pretty much to itself, but recently Multicolor has come to the front. Some of the most outstanding pictures containing sequences photographed by this process are "The Great Gabbo," "This Thing Called Love," "His First Command," and "Red Hot Rhythm."

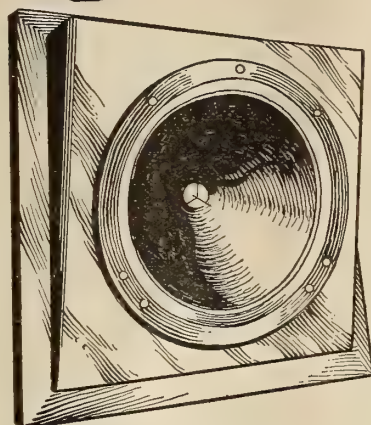
The chief advantage of the Multicolor process is its flexibility, and it is attracting a great deal of attention among those producers who can see in color not only one of the refinements but one of the essentials of

## A Big Special—While They Last

# \$110.00 PHOTOPHONE SPEAKERS



12-inch  
Dynamic



Brand New  
in original  
cases  
Limited Quantity  
Order today

\$15

Never before was such an astounding value offered. Every carnival owner, motion picture house, theatre, church, fair, American Legion Post, club, sound engineers and radio experimenters will want one.

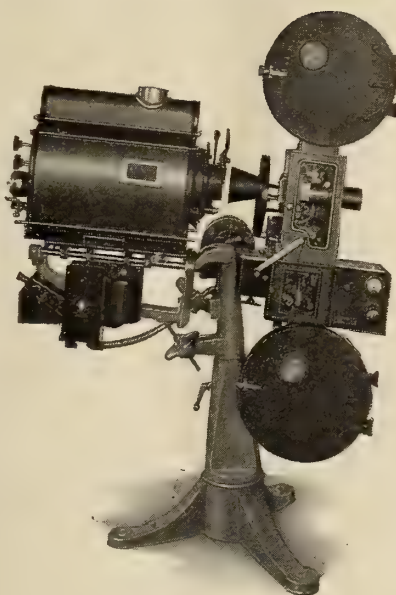
12-inch Dynamic Field Supply; 110 volts D. C.; Field Resistance, 1000 Ohms; Voice Coil, 8 Ohms; Mountings, Steel angle frame. For adaptation to A. C. operations, \$6.50 additional.

Terms: 25% with order; balance  
C. O. D. or Sight Draft.

Specify Express or Freight

M. & H. Sporting  
Goods Co.

512 Market St., Philadelphia



MODEL "U"

Announcing New Type "U"

## SUPERIOR PROJECTOR

Designed especially for the Universal adaptation of all Sound Reproducer Equipment.

The Outstanding Projector with the latest and best improvements for SOUND PROJECTION.

Improvements include: New Head Mechanism, Double Bearing Movement, Rear Shutter, Improved Framing Device, Quick Change-Over Mask, Starting Knob, New Mounting.

Manufactured by

COXSACKIE HOLDING CORPORATION

COXSACKIE, N. Y., U. S. A.

Send for descriptive circular

modern motion picture production. It is, first of all, a simple process and any cameraman can use it with a little instruction, as it enables him to use his own individual equipment. He can use either his Bell & Howell or his Mitchell to photograph with Multicolor, only a slight change in the camera being necessary.

This is of immense advantage to all concerned as it does away with the necessity of purchasing new equipment or of junking that already in use, and, when one realizes that the cameramen of Hollywood own up-

wards of half a million dollars worth of photographic equipment, it is therefore evident that the new process makes for the greatest economy. For use on distant locations, the Multicolor process is especially desirable as it is fool-proof, economical, efficient and does not require any unusual treatment in the laboratory.

In Multicolor, colors are faithfully recorded, and a contributing factor to the success of the process is its ability to photograph interiors with no more light than is needed for monochrome photography.



## Big Navy Contract to RCA

THE largest single order ever placed for motion picture sound reproducing equipment has been awarded by the United States Navy to RCA Photophone, Inc., subsidiary of the Radio Corporation of America, it was announced recently. The contract, which calls for the equipment of battleships, cruisers, destroyers and many shore stations was awarded to RCA Photophone as a result of the bidding on the Navy specifications which were opened on October 31st.

The award involves, it is declared, more than half a million dollars. Twenty first-line battleships, sixty cruisers, one hundred and twenty destroyers and the more important shore stations of the U. S. Navy, making a total of three hundred separate installations, will be equipped with the newest models of RCA Photophone sound reproducing apparatus.

### Big Educational Program

In addition to the fact that the order creates a new high record for a single transaction in the sound reproducing field, the closing of the contract marks the entry of sound on a large scale in the educational program of the U. S. Navy. The demonstration that will thus be made of the educational possibilities of talking pictures and sound reproducing equipment is expected to be watched closely by educational institutions throughout the United States. Although many schools, colleges and other training institutions are already equipped with sound apparatus, no such extensive application of aural and visual education under single control has yet been made.

Navy officials here declare that with the installation of RCA Photophone equipment, a complete scheme of personnel training, general information and cultural education will be adopted on land and sea. It is expected that the motion picture industry generally and that producers of educational films who have recently entered the field will cooperate with the U. S. Navy in furnishing sound films that will not only have the entertainment value required, but which will be valuable in carrying out the Navy's educational program.

### Opens Vast New Field

Once such a demonstration is made on a large scale, it is believed here, a vast new field for the installation of sound reproducing equipment will be open to American industry. A great part of the twenty-five thousand schools of the country and colleges and other educational institutions have not yet been equipped. The total prospects for such equipment in the educational field is much greater, it is declared, than in the purely theatrical field which gave rise to the de-

velopment of the present industry devoted to the manufacture of sound equipment.

Charles J. Ross, Executive Vice President of RCA Photophone, Inc., expressed his satisfaction with the Navy award, which he said would do much to establish the utility of sound pictures for training and educational purposes. "Naturally, we are extremely gratified to learn that the Navy Department has selected RCA sound reproducing equipment for the entertainment and instruction of the thousands of officers and men who constitute this arm of our national service," he declared. "The Navy Department has progressively followed all the developments in this field. To have been accorded this recognition, therefore, following competitive bidding with other manufacturers and following the exacting tests made by the Navy Department, is a tribute which any manufacturer in the field might be proud of. Coupled with the Department of War contract which brought about the installation of RCA Photophone sound reproducing apparatus in sixty army posts throughout the country, this latest and by far the greatest single contract of its kind ever made, has given our sound equipment the most substantial endorsement we could hope to receive.

"I am confident that the use of this equipment for educational as well as for entertainment purposes will do much to establish the scope and importance of sound pictures as a new instrumentality of training and education."

### W. E. & ERPI vs. Pacent

The Western Electric Company has been advised that the United States Supreme Court has denied the Pacent Company's petition for a writ of Certiorari to review the decision of Judge Swan holding that the Western Electric Company and Electrical Research Products were proper parties plaintiffs in the suit against the Pacent Company for infringement of patents.

This brings to an end the protracted proceedings in the so-called "misjoinder of parties" issue and enables Western Electric to press its case of patent infringements in the District Court on the merits of the patents involved.

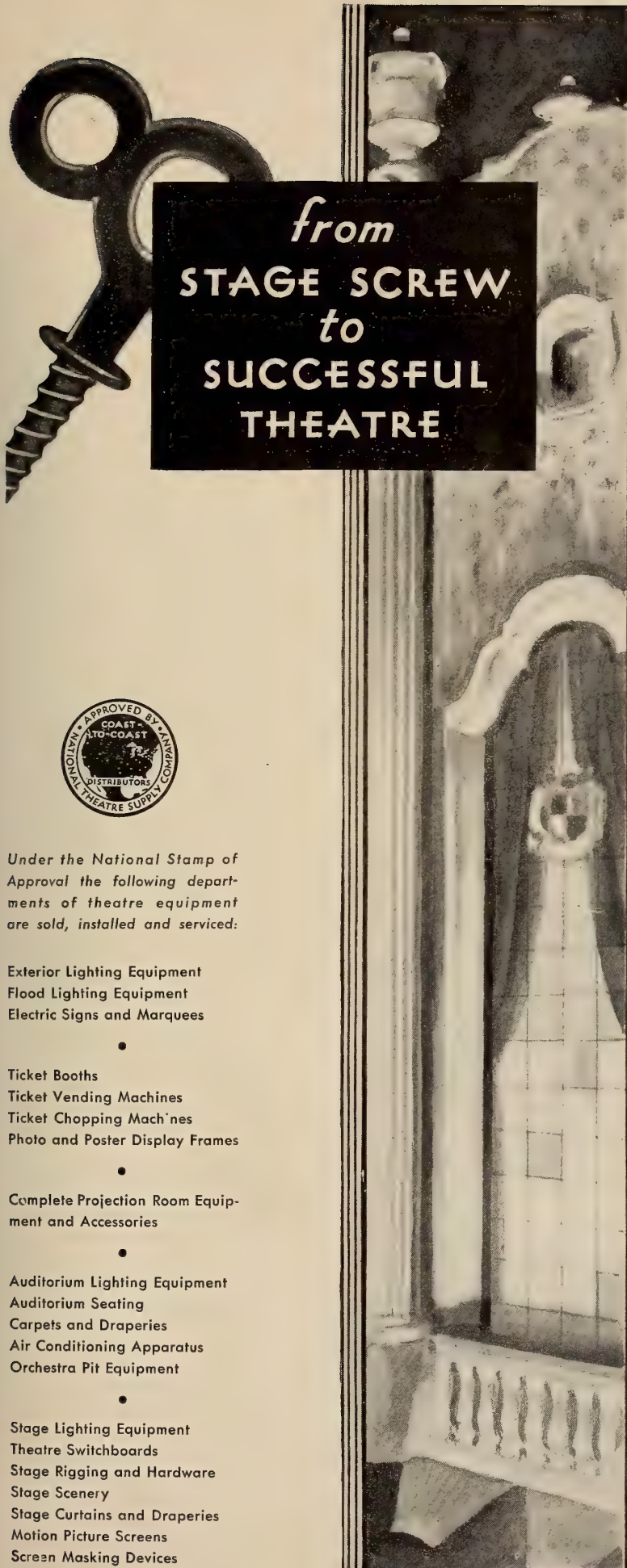
### New Fire Prevention Code

The Hays organization (M. P. P. D. A. O.), the Board of Fire Underwriters, and the N. Y. Bureau of Fire Prevention have announced the final draft of a new code of fire prevention for theatres, studios, and laboratories. This new code, the result of several months coordinated effort, will soon be available at Film Boards of Trade.

## Index of Advertisers

Ashcraft Auto Arc Co.....	10
Best Devices Co.....	38
Bioscope, The .....	41
Blue Seal Products Co.....	36
Brenkert Lt. Projec. Co.....	39
Canadian Theatre Supply Co.....	5
Chalmers Publishing Co.....	41
Coxsackie Holding Corp.....	49
Dowser Mfg. Co.....	7
Eastman Kodak Co.....	43
Enterprise Optical Mfg. Co.....	Cover
Essannay Elec. Mfg. Co.....	9
Fish-Schurman Corp. ....	39
Fogelberg Engineering Co.....	46
Forest Electric Corp.....	40
Fulton, E. E., Co.....	8
G-M Laboratories .....	37
Golde Mfg. Co.....	12
Griffin Manufacturing Co.....	40
Griswold Machine Works.....	46
Hall & Connolly, Inc.....	45
Hertner Electric Co.....	38
Hoffman & Soons, Inc.....	44
Ilex Optical Co.....	Cover
Imperial Electric Co.....	11
Instruments, Ltd.....	47
International Projector Corp.....	4
Kaplan, Sam, Mfg. & Supp. Co....	2
McAuley, J. E., Mfg. Co.....	3
M. & H. Sporting Goods Co.....	49
Mellaphone Corp. ....	47
Movie Supply Co.....	41
National Carbon Co.....	5
National Theatre Supply Co.....	51
Projection Optics Co.....	48
RCA Photophone, Inc.....	26, 27
Rice, J. M., & Co.....	40
Roth Bros. & Co.....	6
Strong Electric Corp.....	37
Theatre Engineering Service.....	42
Weber Machine Corp.....	45
Western Electric Co.....	15





*from*  
**STAGE SCREW**  
*to*  
**SUCCESSFUL**  
**THEATRE**



*Under the National Stamp of Approval the following departments of theatre equipment are sold, installed and serviced:*

Exterior Lighting Equipment  
Flood Lighting Equipment  
Electric Signs and Marquees

•  
Ticket Booths  
Ticket Vending Machines  
Ticket Chopping Machines  
Photo and Poster Display Frames

•  
Complete Projection Room Equipment and Accessories

•  
Auditorium Lighting Equipment  
Auditorium Seating  
Carpets and Draperies  
Air Conditioning Apparatus  
Orchestra Pit Equipment

•  
Stage Lighting Equipment  
Theatre Switchboards  
Stage Rigging and Hardware  
Stage Scenery  
Stage Curtains and Draperies  
Motion Picture Screens  
Screen Masking Devices

It's quite a jump from a stage screw to a successful theatre. But the major elements that build the foundation for theatre success are all included in the National Line of equipment and accessories. If you want a marquee or an electric sign your nearest National Branch will have it for you. Need Projection machines, a generator or lighting equipment? That's there for you, too. So are your ventilating fans, opera chairs, stage rigging, screen, carpets, draperies. They have all won their place in the National Line through selective tests for quality in materials and workmanship and for profit-producing practicability. When you want a battery or a bill poster's brush, your nearest National Branch will get them to you quickly and economically. If you need rush repair work, a National Emergency Man will help you keep the show going. And when you buy complete equipment for a new theatre you can get it from National—all on a one-source plan. From stage screw to successful theatre—the whole range of service is there. "One Source—One Quality—One Guarantee."

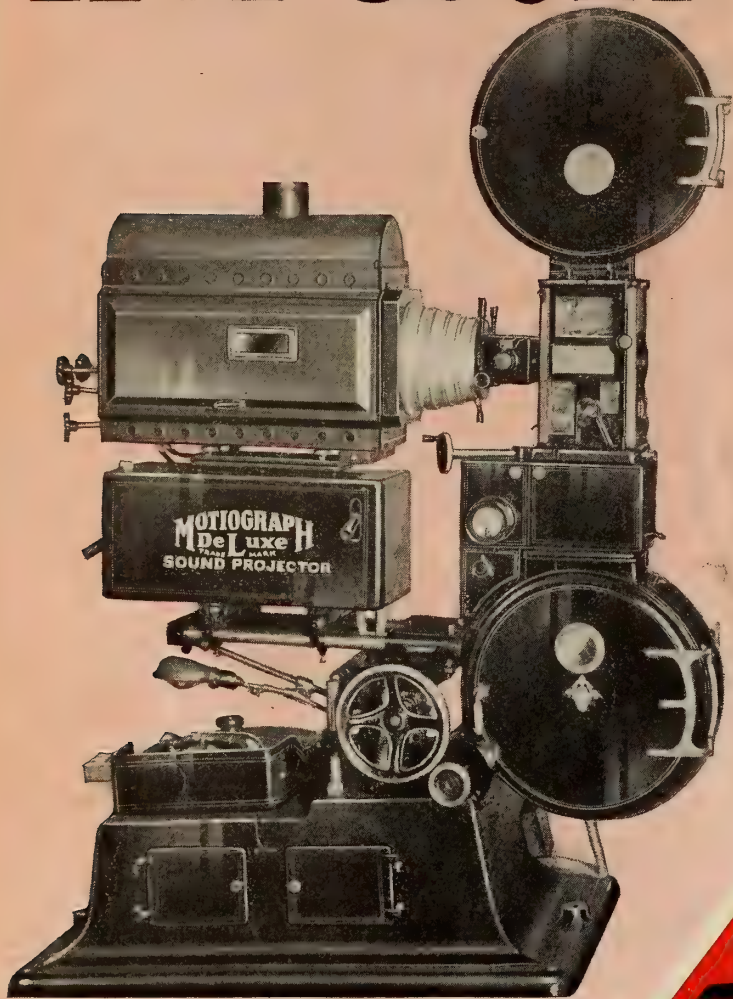
*"De Luxe Your Theatre and Make It Pay" is the suggestive title of our new Fall Catalog. It's full of timely tips. Write or ask for a copy.*

**NATIONAL THEATRE  
SUPPLY COMPANY**  
*Branches in all Principal Cities*

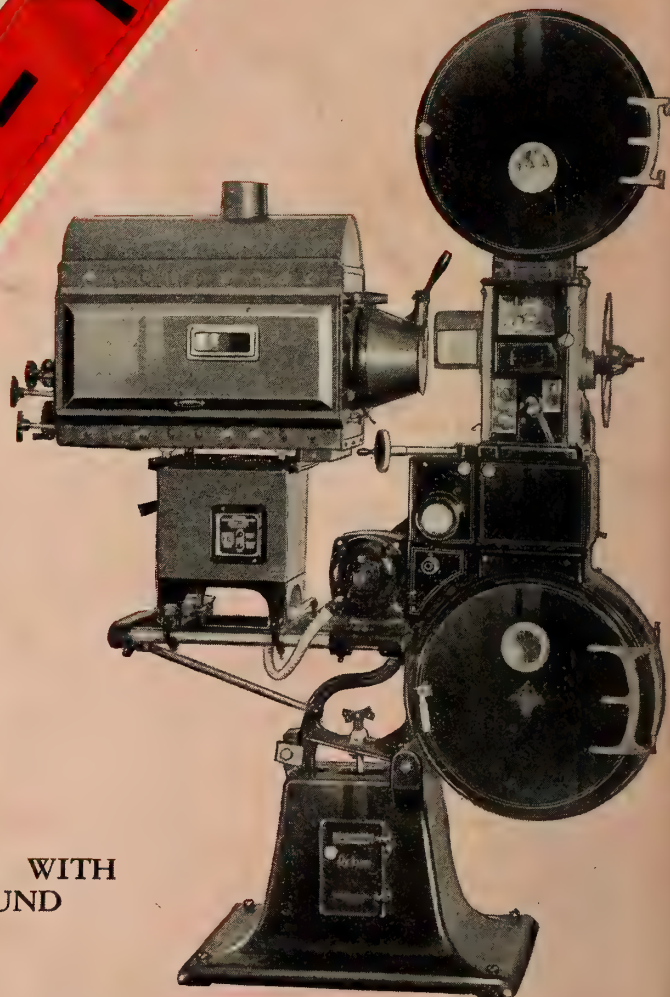


**WHEN YOU BUY IT - YOU OWN IT**

**MOTIOGRAPH DE LUXE COM-  
PLETE SOUND EQUIPMENT**



MODEL "H" SOUND EQUIPMENT  
FOR SOUND ON FILM  
AND SOUND ON DISC



MODEL "F" SOUND EQUIPMENT  
FOR  
SOUND ON FILM ONLY

YOU TAKE NO CHANCES WITH  
THIS GUARANTEED SOUND  
EQUIPMENT!

"MOTIOGRAPH" QUALITY FROM  
PROJECTOR TO SPEAKER BACKED  
BY 30 YEARS OF SUCCESSFUL MAN-  
UFACTURING AND PROJECTOR  
BUILDING EXPERIENCE.

MATCHED, UNIT-BUILT!  
NO ATTACHMENTS!

THE ENTERPRISE OPTICAL MFG. CO., 564 W. Randolph St., Chicago, Ill.



# MOTION PICTURE PROJECTIONIST

(Fourth Year of Publication)

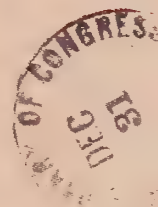
**I L E X**

**F:2.5**

**DUAL FOCUS**

**PROJECTION LENS**

A SINGLE LENS  
FOR A DUAL  
PURPOSE



SOUND ON FILM  
SILENT OR DISC

THE Ilex F:2.5 Dual Focus Lens projects sound-on-film to cover the same size screen area as sound-on-disc holding images in true proportion without distortion. Flatness of field, maximum sharpness, brilliant illumination, coal blacks, snow whites—are truly Ilex characteristics. This lens is adapted for use on all makes of projectors. Insist upon Ilex and be patron insured.

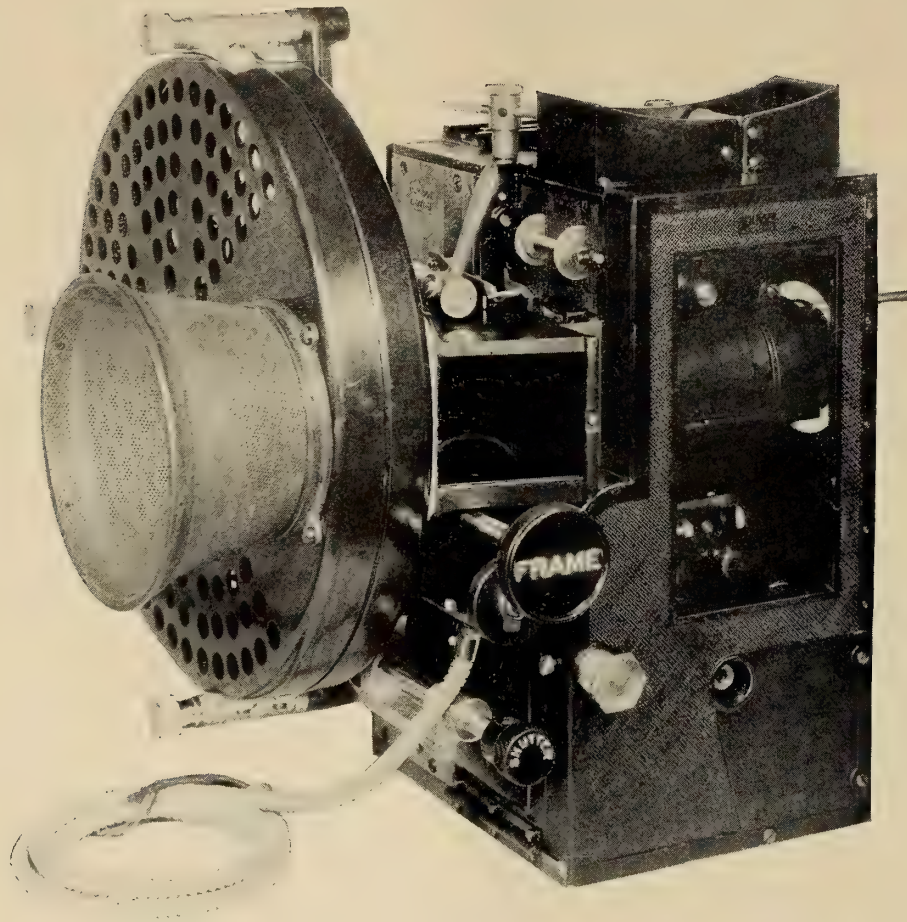
**I L E X OPTICAL COMPANY**  
ROCHESTER NEW YORK

THE BEST LENS TESTING LABORATORY IS YOUR SCREEN



*Now Ready!*

# KAPLAN REAR SHUTTER



Can be Attached to Any Sure-Fit  
or Simplex Mechanism

*See your local dealer or write to us*

Sam Kaplan Manufacturing and Supply Company, Inc.

729 Seventh Avenue

New York City



# New Light *Exceeds* ... Sun's Brilliancy

**M**ODERN projection calls for a light source equaling and in some cases exceeding the brilliancy of the sun itself.

Sound, color, and wide films, with long throws on porous screens now demanded by the modern theatre, have called for a most intense and active program of research and development to keep National Projector Carbons ahead of the requirements of modern projection.

The concentration of large quantities of electrical energy in slender carbons, while keeping the light confined to a point source, represents a most remarkable advance in lighting practice.


The results of this development program have been the production of National Projector Carbons of the highest quality with economies which make carbon costs extremely low in comparison with other important items needed for the successful operation of the theatre.



*National Carbon Company will gladly cooperate with the producer, exhibitor, machine manufacturer or projectionist on any problem involving light. . . .*

**NATIONAL CARBON COMPANY, INC.**

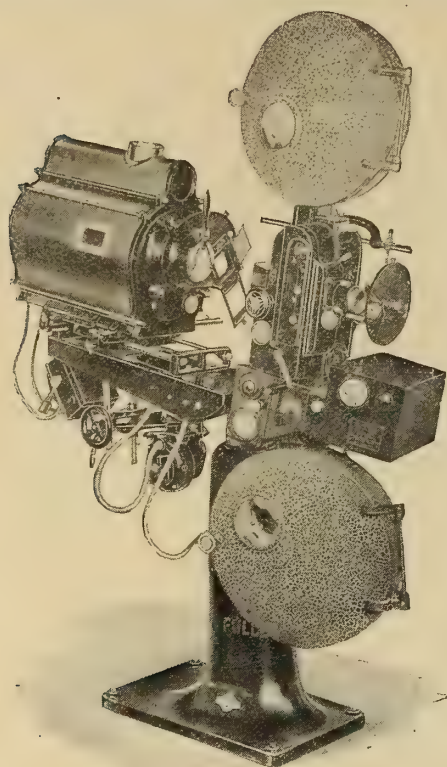
Carbon Sales Division      Cleveland, Ohio

Unit of Union Carbide  and Carbon Corporation

Branch Sales Offices:    New York    Pittsburgh    Chicago    San Francisco



# WORLD'S BEST THEATRE EQUIPMENT



FULCO PROJECTOR  
(Ernemann Design)

## IF WE CAN INDUCE YOU

to really examine the Fulco Projector fairly and impartially, it is certain that you will have none other. And the more experienced you are and the more qualified and exacting you are, the more certain it is that you will prefer no other.

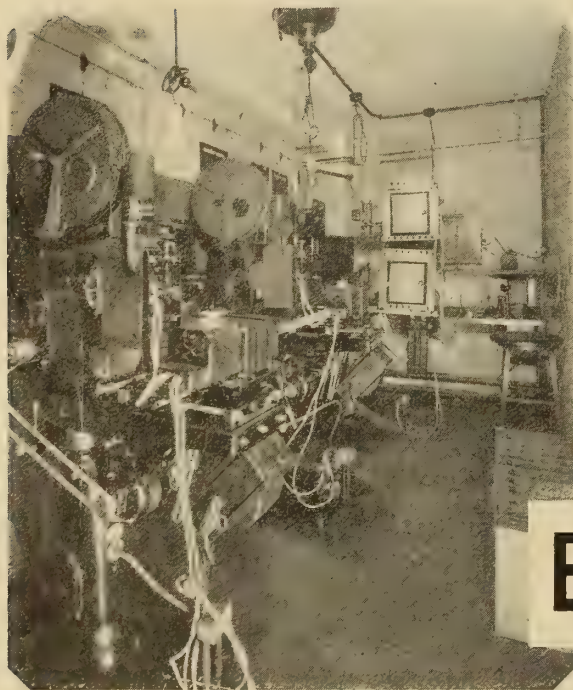
Engineers and projection experts are not moved by sales talk, but they are influenced and decided, by points of superior merit which they are quick to perceive and appraise.

The greater a man's qualifications for judgment as between the Fulco Projector and all competitors, the more certain are we of selling him a Fulco.

We can show you abundant evidence of this. If you want further proof and confirmation, Ask the Man Who Owns or Operates One.

On demonstration at all Fulton branch offices located in the following cities:

CHICAGO.....1018 So. Wabash Ave.	LOS ANGELES....Film Exchange Bldg.
NEW YORK.....115 W. 45th St.	ST. LOUIS .....3232 Olive St.
BOSTON .....65 Broadway	MILWAUKEE.....151 Seventh St.
PHILADELPHIA.....1337 Vine St.	INDIANAPOLIS .. 340 No. Illinois St.
ATLANTA .....146 Walton St.	SAN FRANCISCO...255 Golden Gate Ave.



## E. E. FULTON CO.

C. H. FULTON  
President

A. G. JARMIN  
Treasurer

Executive Offices: 1018 So. Wabash Ave., Chicago Factory: 2001-2007 So. California Ave., Chicago



E. E. FULTON COMPANY, COAST to COAST DISTRIBUTORS



# MOTION PICTURE PROJECTIONIST

January, 1931

Vol. 4, No. 3

JAMES J. FINN, Editor

Lester Isaac, *Efficiency*; J. H. Kurlander, *Light*; Arthur Gray, *Conservation*; J. E. Robin, *Equipment*; Samuel Wein, *Research*; R. H. McCullough, *Sound Projection*; Harry Rubin, *Improvement*; Victor Welman, *Personnel*; Sidney Burton, *Production*.

Published monthly by Mancall Publishing Corp., 45 West 45th St., New York City. Subscription rates in U. S. and Canada: twenty-five cents per copy; two dollars per year; three dollars for two years. Add one dollar for foreign postage. Changes of address should be submitted three weeks in advance of publication date to insure receipt of current issue.

Entered as second class matter Oct. 25, 1927, at Post Office, New York, N. Y., under the act of March 3, 1879.

## Canadian Representative

H. N. Elliott, Suite 11, 27 Sherwood Ave., Toronto, Canada.

## Australian Representative

McGill's Agency  
179 and 218 Elizabeth St.  
Melbourne, Australia

## Editorial & Advertising Office

45 West 45th St.  
New York City



## Utilize Sensitive Paper for Sound Recording

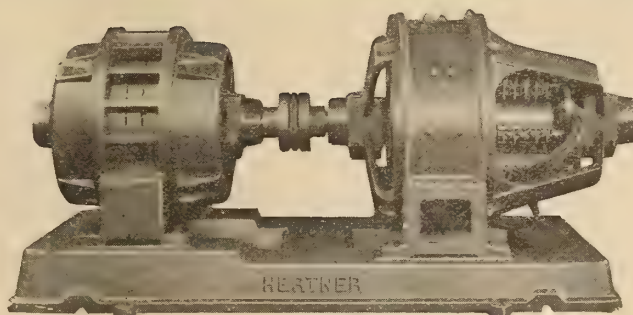
The selenophon system is to be used on paper stock, according to American Trade Commissioner George R. Canty, Paris. At the congress of German broadcasting companies in Vienna, the German representatives showed much interest in a new paper film manufactured by Selenophon.

This is a system in which the Selenophon method is used for recording sound on a sensitive paper strip. If the sound-track is 6 mm. large, it is possible to place four such tracks on the paper ribbon.

## Could Record Whole Operas

In this case 300 meters of paper film would take 40 minutes to be projected. It is claimed to be possible to register whole operas according to this system, as the difficulties inherent to the use of discs fall away.

It is not impossible German broadcasters will make use of this paper stock, providing the planned negotiations with Selenophon lead to a satisfactory conclusion.



**It Has Been Proven Again and Again  
In this Industry, That To Make Money  
You Must Spend Money.**

The Public likes to be *Comfortable*.

Tired eyes keep many a Customer away, while the simple installation of the TRANSVERTER brings them back again and again!

The TRANSVERTER means smooth projection on the screen — comfort for eyes—greater enjoyment for your Patrons.

Look for the silent leaks at your Box Window!



Investigate the TRANSVERTER — it will help you overcome competition.

Canadian  
Distributors,  
Perkins  
Electric,  
Ltd.

**THE HERTNER ELECTRIC COMPANY**

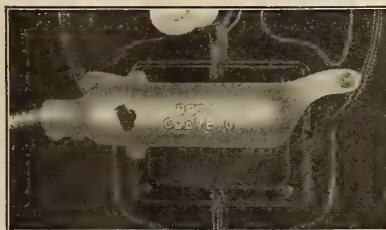
**Transverter**

Exclusive Manufacturers of the Transverter

12688 Elmwood Avenue

Cleveland, Ohio, U. S. A.

## “BEST” Magazine Light



Price \$3.50 at your dealers

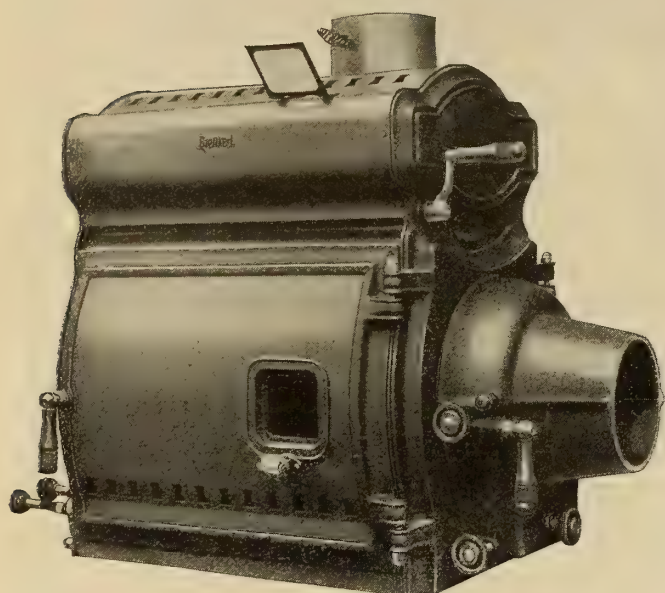
attaches to side of magazine illuminating the inside showing the exact amount of film on reel from either side without opening door.

**BEST DEVICES CO.**  
200 FILM BLDG., CLEVELAND, O.



# THE NEW BRENKERT

**SUPER HIGH INTENSITY  
PROJECTION LAMP**



**Consistently Produces  
UNEQUALLED  
SCREEN RESULTS!**

with

**Higher Efficiency, More Accurate Operation,  
Lower Operating Costs and Greater  
Convenience**

**PROVEN BY INSTALLATIONS!**

**YOUR THEATRE CAN PROFIT  
BY THESE ADVANTAGES**

Manufactured complete in the large Brenkert plant. Sold  
and Serviced by Dependable Dealers throughout the country.

WRITE FOR ILLUSTRATED  
LITERATURE AND NAME OF  
YOUR NEAREST DEALER

**"IT'S A BRENKERT PRODUCT"**

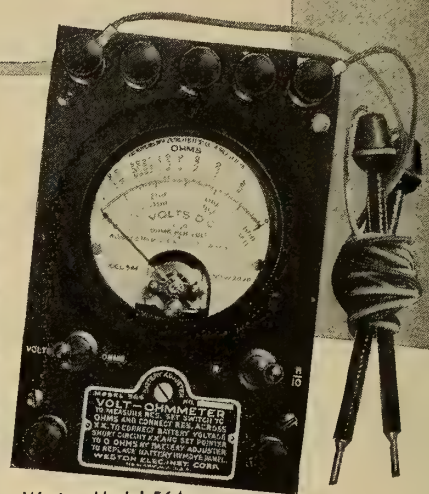
*Correct Design — Precision Construction*

**BRENKERT LIGHT PROJECTION Co.**

*Engineers & Manufacturers  
DETROIT, MICH.*

**LIGHT, HANDY  
VOLT- OHMMETER  
FOR TESTING  
VOLTAGES,  
RESISTANCES  
and CONTINUITY  
OF CIRCUITS**

**P**ROJECTIONISTS have found this light, compact instrument to be very useful in checking line voltages, tube and rectifier voltages, horn circuits and at the many other points where reliable knowledge of voltages or resistances is necessary to the efficient operation of sound apparatus.



Weston Model 564

Model 564, though moderately priced, is built to give the reliable, accurate service that has made Weston instruments the accepted standards of electrical measurement.

This instrument consists of a Weston Model 301  $3\frac{1}{4}$  inch diameter meter with ranges of 600, 300, 30 and 3 volts (all 1,000 ohms per volt) and two resistance ranges of 0-10,000/0-100,000 ohms. Accuracy 2%. Two toggle switches connect the various ranges of the meter in circuit. A self-contained "C" battery is provided—any change in its voltage can be readily compensated for by simply short circuiting the binding posts and adjusting the meter pointer to the zero ohm position by turning the voltage adjuster. A pair of 30 inch cables with long test prods is provided with each Model 564.

Model 564 is contained in a sturdy black Bakelite case. Size:  $5\frac{1}{2}$  x  $3\frac{5}{8}$  x  $2\frac{7}{8}$  inches. Weight: 2.3 pounds (including "C" battery).

**Weston**  
PIONEERS  
SINCE 1888  
**INSTRUMENTS**  
WESTON ELECTRICAL INSTRUMENT CORPORATION  
617 Frelinghuysen Ave. Newark, N. J.



# "Building Theatre Patronage"

By JOHN F. BARRY and EPES W. SARGENT

*Simplex*  
The International Projector

Extracts Reprinted by Permission  
Chalmers Publishing Company, New York

*Simplex*  
The International Projector

## BETTER PROJECTION PAYS

**T**O-DAY audiences know good projection. They may not use technical terms in discussing it, but they do discuss it. They may not walk out on poor projection, but they avoid the theatre where it is permitted.

### GOOD PROJECTION IN MANY CASES IS THE DECIDING ELEMENT WHICH DETERMINES PATRONAGE AT A THEATRE

The theatre manager may not be responsible for the theatre site, for the quality of productions booked, for the equipment and decoration of the house, or even for the extent of advertising which is limited by an exacting advertising budget. But projection is something for which he is responsible. He cannot be efficient if he cannot supervise projection. There are instances where managers spend time complaining about the quality of photoplays available, when projection at their theatres is so defective that discriminating patrons would avoid the theatre no matter what was on the program. Good projection is demanded to-day from everyone—from executives at the studio who know that poor projection can ruin a good photoplay, right down to the patrons at the theatre.

### DEFECTIVE PROJECTION CAN MAKE SATISFACTORY ENTERTAINMENT IMPOSSIBLE

Why is projection important? The very nature of motion-picture entertainment makes it so. During such entertainment patrons like to feel that they are part of the story, living the action—moving, fighting, fearing, thrilling, moving on and conquering with the characters on the screen. Thus they live what might be called an "illusion". They are carried away to the scene of the action, or, better still, find themselves right in the action. This illusion makes entertainment satisfactory. It cannot be satisfactory if something happens to spoil the illusion—something that reminds the patron that he or she is sitting in a theatre chair looking at a two-dimensional surface covered with light and shadow. Defective projection prevents the patron from slipping right into the story, and living through it with the characters. Defective projection can jerk the patron right out of the action of the story and spoil the illusion that is being lived through.

## SUPERVISION

The quality of projection depends in some way upon the manager's supervision. He is responsible for every detail of operation, and this includes projection. This does not imply that the manager should be blundering and interfering with the projectionist. The manager who tries to interfere without knowing what it is all about, is just as much at fault as the ignorant, over-cautious manager who lets projection go on without any supervision because he is afraid to speak. The ideal condition exists when the theatre manager is familiar with the problems and can talk the language of the projectionist—and when the projectionist, taking real pride in his work, desirous of putting the best possible projection in the same at the least possible cost, is capable and conscientious and thoroughly interested in the welfare of the theatre. Then the manager and the projectionist can discuss common problems, each confident in the practical common sense and the interest of the other. Poor projection has put theatres out of business and in many cases it was often someone else and not the projectionist who was responsible.

## ECONOMIES

### CARELESS MAINTENANCE OF EQUIPMENT IS THE CAUSE OF MANY WASTED DOLLARS. PARTS SHOULD BE ORDERED LONG ENOUGH IN ADVANCE TO PREVENT EMERGENCIES AND TO SAVE THE EXPENSE ENTAILED BY TELEGRAMS.

If the manager is promptly informed, many economies can be practiced and projection can be properly supervised. The manager who can distinguish good projection from bad projection, watching it from different positions in the house, can help the projectionist whose opinion is based on what he sees only from the porthole of the projection room. When defects are noticed, inquiry should be made into the cause of the defect and provision made so that it will not happen again.

As far as the manager is concerned, good projection depends upon three things: technical knowledge, good business sense, and a personality that will develop the proper relationship with the projectionist. All three are essential. Intelligent supervision will be difficult unless there exists a spirit of co-operation and mutual understanding between the manager and the projectionist.

## FOR BETTER PROJECTION

*Simplex*

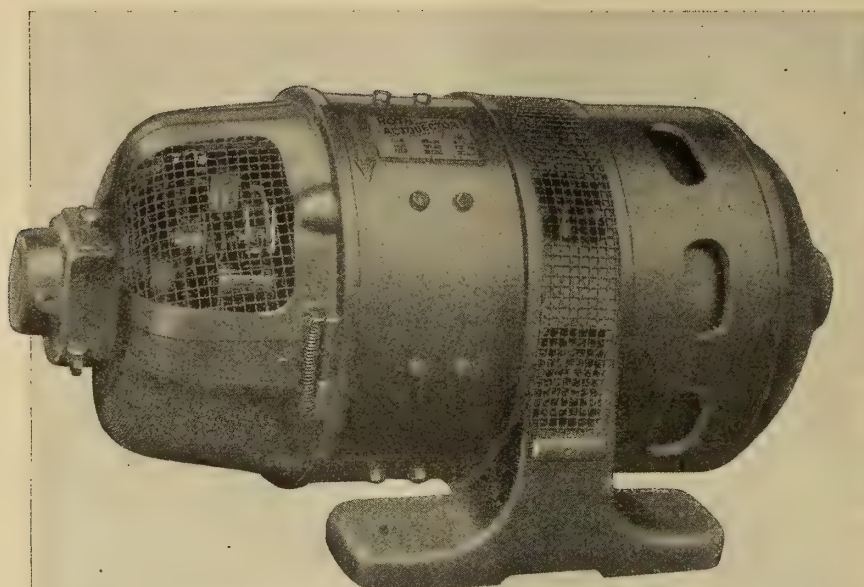
TRADE MARK REG'D.

## THE INTERNATIONAL PROJECTOR

The International Projector Corporation :: :: 90 Gold Street, New York



# THEY KEEP A-RUNNING



20/40 to 100/200 Ampere 2-Bearing Actodecor

## MEET ANY SIZE REQUIREMENTS

### ROTH Emergency Lighting Plants

are giving thoroughly dependable satisfaction in many of the largest circuit and independent theatres.

Any number of arcs can be carried within the ampere ratings of Roth Multiple Arc Type Actodecors. The sizes range from 20 to 600 amperes . . . They supply steady power to the arcs, which results in brilliant screen illumination of uniform intensity, even during changeover, and their smooth, quiet performance makes them particularly desirable for use with sound equipment. Furnished in 2 and 4-bearing types.

## ROTH BROTHERS AND COMPANY

*Division of Century Electric Company*

1400 W. Adams St.

Chicago, Ill.

*Distributors and Offices in all Principal Cities*

ACDC-1

DIRECT CURRENT  
MOTORS AND  
GENERATORS



MOTOR GENERA-  
TOR SETS AND RO-  
TARY CONVERTORS



# The Elements of Optics

By SIEGFRIED S. MEYERS †

## II

**O**PTICS plays such a very vital role in determining the success of motion pictures that it is very important for the projectionist to have an adequate knowledge of light and its behavior so that he will be prepared in his time of need. The basic principles of optics have long been known, but the field of application is constantly broadening as science progresses.

In last month's installment we learned that light was a wave motion which traveled through space at a definite speed, and that its speed could be retarded depending on the character of the medium through which it was traveling. We also learned that a beam of light may be traced through a lens by simply following a few rules, and by joining the necessary lines to produce the image.

A simple camera consists of a box in which a lens and shutter are mounted for the purpose of focusing a given object, upon the sensitized film. The lens is the convex type and converges the rays from the object on to the screen. The human eye resembles the box camera in very many respects. The lens of the eye corresponds to the camera lens. The eyelid resembles the shutter, and the retina corresponds to the sensitized film. (Fig. 1.)

The human eye is not as perfect an organ as we are sometimes led to believe. A great many people have defective vision and wear eyeglasses to correct their defects. Some people are said to be near-sighted, and others far-sighted. By these terms we have reference to the point of convergence of the image. If the lens of the eye is not of exactly the correct shape, the image may fall too far behind, or too near in front of the fixed retina. As a result, persons possessing this defect do not experience sharp vision because of improper focus. Hence

† Instructor of Physics, Stuyvesant High School, New York City.

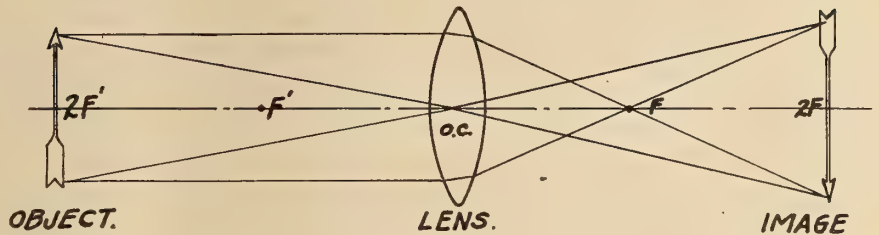
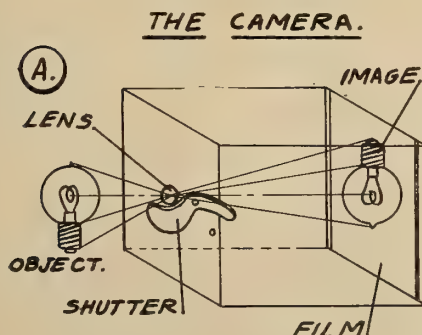


Figure 2

eyeglasses are used either to converge or diverge the path of the rays before they reach the lens of the eye, the converging lens being used for far-sighted people, so that the image will fall nearer to the eye; and the diverging lens for near-sighted people, to bring the image up to the retina.

### Lens Formulas

It is often desirable to calculate the type of lens to use in a given optical system. Suppose we wish to bring to a focus an object which is 8 inches distant from a lens. From experience we know that if the object is further away than twice the focal length of the lens, the incident rays will be parallel and the image will converge at the principal focus. Now, if we use the following formula, we can determine how far away the screen must be placed:

$$\frac{1}{Do} + \frac{1}{Di} = \frac{1}{F}$$

If we use a lens the focal length of which is 4 inches:

where:  
Do = distance of object from the lens = 8 inches

Di = distance of image from the lens = ? inches

F = focal length of the lens = 4 inches

Substituting these values in the formula:

$$\text{then: } \frac{1}{8} + \frac{1}{Di} = \frac{1}{4}, \text{ least common}$$

denominator is: 8 Di.

Solving by algebra:

$$Di + 8 = 2 Di$$

$$Di = 8 \text{ inches, Answer}$$

Therefore, a real image will converge at twice the distance of the principal focus and on the other side of the lens. But, since the rays converge with this type of lens, it is at once apparent that the image will be inverted. (Fig. 2.)

Now suppose it is desirable to obtain a different size image, either larger or smaller. By moving the object nearer the lens, it is obvious that the image will also tend to move farther from the lens. This can readily be seen from Fig. 3.

As we change the relationship between the object distance and the image distance, we change their relative sizes in accordance with the following formula:

$$\frac{\text{Length of Image}}{\text{Length of object}} = \frac{\text{distance of image from lens}}{\text{distance of object from lens}}$$

Thus, if the length of the object is 2 inches, its distance from the lens 4 inches, and the distance of the image from the lens 12 inches, we can easily solve the problem of the length of the image, namely:

$$\frac{Li}{Lo} = \frac{Di}{Do}$$

$$Li = \frac{Lo \times Di}{Do}$$

Where:

$$\begin{aligned} Li &= ? \text{ inches} \\ Lo &= 2 \text{ inches} \\ Di &= 12 \text{ inches} \\ Do &= 4 \text{ inches} \end{aligned}$$

Substituting these values:

$$Li = \frac{2 \times 12}{4} = \frac{24}{4} = 6 \text{ inches, Answer.}$$

Hence, this type of lens magnifies the size of the object three times. This is essentially what happens as the film picture is enlarged upon the screen. On other occasions it is desired to reduce the size of the image. The same formula holds for all en-

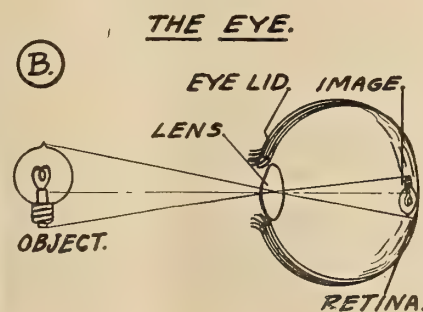


Figure 1



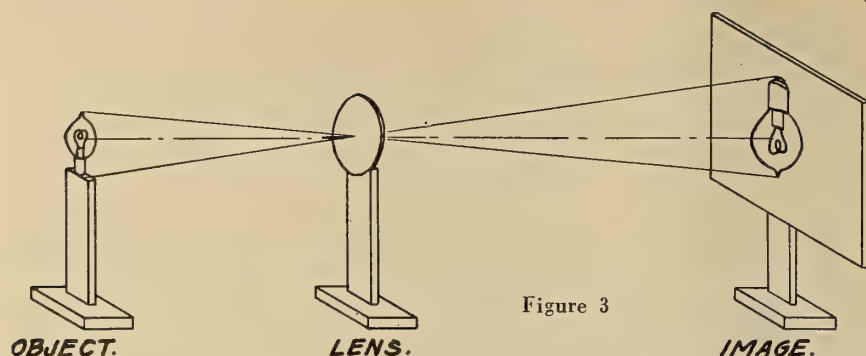


Figure 3

largements or reductions, if we simply substitute three of the four terms.

#### Law of Inverse Squares

Another consideration in these computations is the intensity of illumination upon the screen as we move the source of light away from the screen. It is perfectly obvious that the brightness of a printed page diminishes as it is placed further from a light source, and the amount of decrease in illumination depends primarily upon the distance from that source. Let us

area varies inversely as the square of the distance.

Formula:

$$\text{Intensity} = \frac{\text{candle-power}}{(\text{distance})^2}$$

#### Candle-Power of a Lamp

Suppose it is desirable to check the candle-power of a lamp. If we have a standard lamp the candle-power of which is known, we can connect both lamps equidistant from a translucent screen and placed on opposite sides.

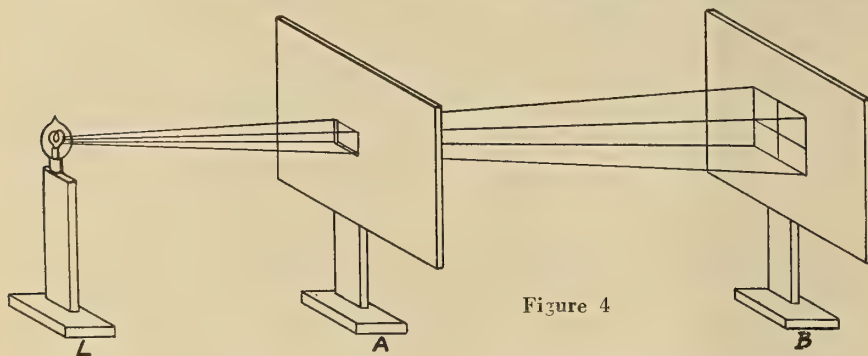


Figure 4

consider Fig. 5: Suppose screen A has an opening of one square inch. Light proceeds from the source, passes through the opening in A, and illuminates an area on B very much larger than that of A. If we move B further from A, we find that the light tends to spread out, illuminating more and more of B as it progresses.

Quantitatively, let us assume B to be a distance of 1 foot from A. Then the area of illumination is found to be four times, though the intensity on each unit is only one-fourth. As B is moved 2 feet away we do not get twice the illumination but rather get four times the illumination. When B is 3 feet removed, we get nine times the area; and when B is 4 feet, we get an area of illumination sixteen times that of A, but the intensity on each unit is only one-sixteenth.

#### Formula

Hence, we conclude that the area and intensity does not vary directly as the distance of B from A but rather as the square of this distance. But each unit area of B is not as bright as A. Although there are many more areas, their individual brightnesses are correspondingly reduced. From this we conclude that the intensity of illumination on each

venient values, we see how simple it is to compute the intensity of an unknown lamp:

$I_x$  = Unknown candle-power = ? c. p.

$I_s$  = Standard candle-power = 50 c. p.

$D_s^2$  = (2 feet)<sup>2</sup> = 4 feet

$D_x^2$  = (4 feet)<sup>2</sup> = 16 feet.

Substituting these values:

$$I_x = \frac{50 \times 16}{4} = \frac{800}{4} = 200 \text{ candle-}$$

power, Answer.

#### Reflection

We have seen how light behaves as it passes through a transparent medium like a lens. We shall now consider the behavior of this light as it is incident upon a plane surface. We have all experienced reflection from a smooth surface like a mirror, or sheet of glass. The incident rays proceed toward the polished surface and are regularly reflected producing an image which appears to come from behind the screen. This phenomenon is commonly called "regular reflection." (Fig. 5.)

It will be noted that the image appears to be as far behind the mirror as the object is in front of it and that the angle which the incident ray makes with the normal to the mirror is equal to the angle of the reflected ray; and that the incident ray, the reflected ray, and the normal to the mirror, all lie in the same plane. This is known as the law of reflection.

#### Diffused Reflection

There are certain times when regular reflection is undesirable. For example, a screen in a theatre must be so constructed as to avoid regular reflection, lest there be produced glare effects. Hence, some alternative method of reflecting the image of the arc lamp to the audience must be resorted to. This method is known as *diffused reflection*. Diffused reflection can only emanate from a surface which is dull, rough, and irregular; whereas, regular reflection emanates from a smooth, regular, and polished surface.

In diffused reflection, light is reflected in accordance with the law of reflection, but it is reflected heterogeneously, thereby preventing the glare which is experienced in homogeneous reflection. Consequently the moving picture screen is made of a material having many rough pockets which

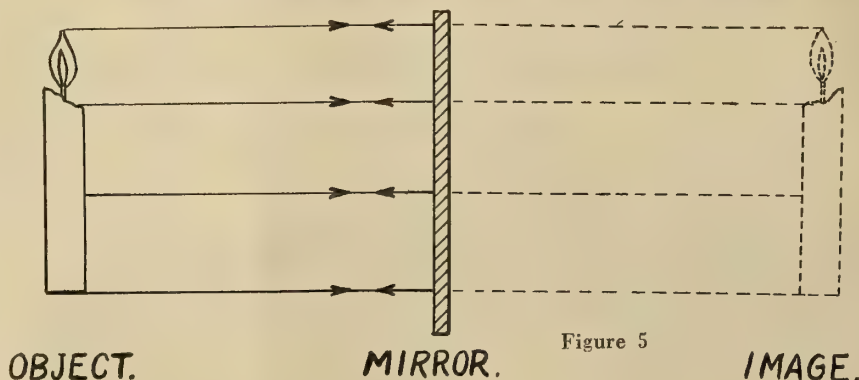


Figure 5



will reflect the incident rays in various directions, depending on the particular angles of these pockets. (Fig. 6.)

#### Shadows

In the old-fashioned theatre it was the custom to show shadow performances on a screen illuminated from behind. It was desirable at that time to produce shadows which were clear-cut so that the movements of the actors would be clearly seen. An explanation of the method used in obtaining clear-cut shadows is of interest here. Let us take an arc lamp which produces an intense light source coming from an apparently small point. In front of this lamp let us suspend an opaque body, so that a shadow will be cast upon the screen. The clear, sharply-defined shadow is very evident. This kind of a shadow is called an *umbra*, which means shadow. (Fig. 7.)

Now let us substitute for the arc lamp an electric bulb, which does not emit light from a single point but

it when it passes through various mediums. Refraction and reflection should be thoroughly understood. Calculations for one type of machine do not necessarily apply to other machines. Lenses cannot be ground exactly alike. Continuous projection by means of a system of rotating

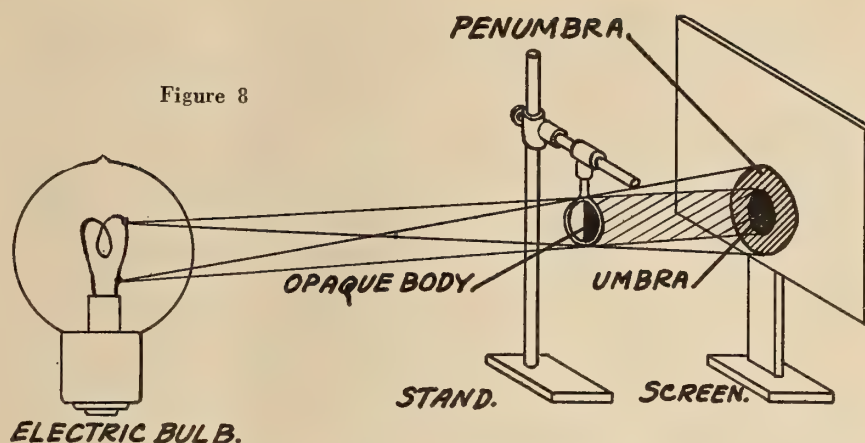


Figure 8

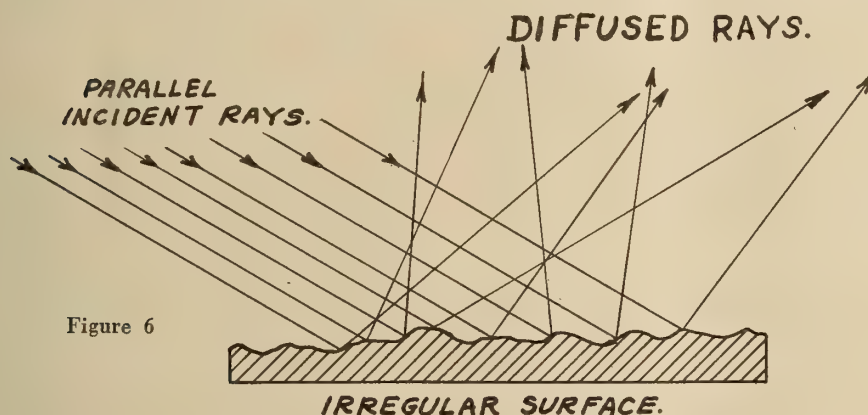


Figure 6

rather from a great number of points. If we trace the path of light from each point, as we did for the arc lamp, we find that the shadow is no longer clear-cut but seems to have a lighter shadow surrounding the umbra. This lighter shadow is called the *penumbra*, meaning "around the umbra." For shadow performances the penumbra was very undesirable, for the movements of the actors were not very clear. Hence, to produce sharp shadows, a point source of light like that from an arc lamp was necessary. (Fig. 8.)

A knowledge of light and its behavior is an absolute necessity for the projectionist. He must know the nature of light and what happens to

lenses is a possibility, and this introduces the problem of grinding lenses all of which must have equal focal lengths. This, in addition to the introduction of wide film, will make optics the most important subject on the projectionist's list. Fundamentals will, of course, remain constant, but one's fund of information on the finer details of optics should be added to constantly.

In a subsequent installment we shall see how a beam of light can be traced from its source through the aperture and film to the light sensitive cell. With the aid of a few elementary rules on image formation, we shall see that the process is quite simple.

(To be continued)

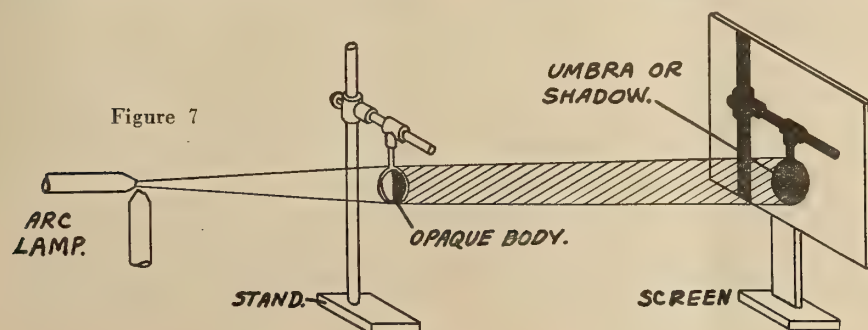


Figure 7

#### Interesting Data Revealed by Sound Picture Survey

CONDITIONS in the amusement field are adjusting themselves in orderly manner to the business situation. Payments on credit accounts are being maintained surprisingly well in view of financial conditions. Business promises to show a distinct improvement in the future. Theatres equipped to give quality reproduction of talking pictures are, in most cases, doing an even bigger business than they did a year ago.

These conclusions, according to C. W. Bunn, general sales manager of Electrical Research Products, are based upon an impartial nation-wide statistical survey made by his sales organization.

"The most surprising part of our survey," he said, "is that while most printed reports list the number of motion picture theatres in this country at more than 25,000, the actual count by our field force shows less than 16,000 theatres in operation. Approximately 10,000 theatres have been closed, temporarily or permanently, because they were unprepared to meet the competition of talking pictures adequately reproduced.

#### Increased Attendance

"At first glance this diminished total of theatres might lead to the conclusion that the popularity of pictures has waned. This is not so. What it means is that the public, aware of the difference between good and inadequate reproduction, is patronizing the theatres where the reproduction is satisfactory.

"The patronage formerly enjoyed by the 10,000 theatres that have closed is now going to the 16,000 remaining houses. Their total weekly patronage today is larger than the weekly motion picture attendance at any previous time in the country's history.

"Of these 16,000 theatres about 10,000 have sound equipment. Of this number 4,800 have the Western Electric system and about 6,200 other kinds of apparatus.

"Our information indicates that



about 2,500 of the closed theatres have a possibility of reopening.

#### 1,470 W. E. Replacements

"To date we have replaced 1,470 equipments of various makes with Western Electric. At the present time one-half of our installations are replacements of equipments that either reproduced inadequately or were not supported by the necessary acoustic advice to provide the best possible reproduction or by a nation-

wide service staff to assure uninterrupted operation or by an adequate supply of replacement parts throughout the country to maintain repairs with the minimum of delay.

"We are ready now with the co-operation of engineers of the Bell Telephone Laboratories and the manufacturing resources of Western Electric to expand the cooperation we are offering exhibitors at any time that we see it is in the best interests of good sound reproduction to do so."

## Spoor Wide Film Chicago Showing

By L. D. Strong

*Supplementing a previous description<sup>1</sup> of the Spoor-Berggren process in these columns is the following communication from L. S. Strong of the Essanay Electric Mfg. Co., anent the recent presentation at the State-Lake Theatre in Chicago of the Spoor process. Items of pertinent interest to the projectionist are included in this brief summary by Mr. Strong who is one of the State-Lake projection staff.—Editor.*

THE data presented here is necessarily incomplete for the reason that no photographs of the Spoor-Berggren equipment are available as yet, and it is rather difficult to convey an accurate idea of the apparatus without illustrations. However, there are certain pertinent facts in connection with a presentation of this character which will be of interest to all projectionists and these facts I have included here.

As we know, the projectors used with the Spoor process are of special design by P. J. Berggren and contain only seven gears. They are completely hand made and, as is to be expected, are somewhat crude due to having been made particularly for experimental work in the laboratory under ideal conditions and without much thought having been given to the various conditions to be met in the average theatre projection room. This is not said in any derogatory sense, as the results secured with the Spoor apparatus were truly remarkable.

#### Noise a Serious Problem

One serious objection to the equipment as now constituted is the problem of the terrific din set up by the apparatus. In the projection room it is necessary to stuff one's ears with cotton in order to keep out the noise of the machinery. The noise given off by the apparatus is only comparable to being alongside a machine gun or a riveting machine. Much of this noise is given off by the loops, and as the machine has an open mechanism there is nothing to deaden the sound. This is one thing on this system that demands immediate attention, as it would be impossible for

any projection staff to work the equipment for more than a week under this handicap.

The film is held rigid over the aperture by compressed air. This serves to keep the film cool as well as to prevent buckling. This compressed air, which is also led to the inner sides of the loops, is supplied by a compressor driven by a  $\frac{3}{4}$  h.p. motor, all of which is mounted on the base of the machine.

The gate is similar to that used on a Powers projector and has an adjustable tension feature. A special three-wing shutter is used which gives a fading effect instead of cutting off the picture sharply.

#### Separate Sound Track

The sound track is on a separate reel which is run through an RCA sound head located at the side of the picture projector and is driven by the same motor which drives the projector. At the Chicago showing there were three projectionists assigned to a shift, with three shifts working 5 hours each. As each reel ran only about 7 minutes, all three men are kept busy continually:—one threads up the picture projector, another the sound head, while the third man watches the fader, rewinding and trimming. It is very evident that there is no lost motion on the part of any projectionist with this type of set-up. As the picture film is run through the projector in the ratio of 20 frames to 24 frames of the sound track film, it will be seen that in the event of a break one has to be something of a mathematician to figure out the synchronism.

The projection staff opened the showing absolutely "cold", which accounts in some measure for the unfavorable comment of one Chicago daily newspaper review, abstracts of which are appended hereto. Most of these defects were ironed out after the first few showings, and subsequent shows went off without a hitch. The following data will be of particular interest to projectionists:

Size of picture. .44x24 ft.  
Length of throw. 122 ft.  
Film size . . . . .63 mm. 6 sprockets to a frame

Lamp . . . . .Super high intensity  
Amperage . . . . .160  
Carbons . . . . .16 mm.  
Condenser Comb.  $9\frac{1}{2}$ — $10\frac{1}{2}$ , quartz  
Distance from condenser to aperture . . . . .19 in.

Mae Tinee writing in *The Chicago Tribune* records the following reaction to the Spoor pictures:

... "Niagara Falls" is revolutionary and wonderful. Some of the shots are so grand, so vividly real, as to be almost unbelievable. There you are, sitting in a theatre on State street, with the beauty and magnitude of the falls passing before your eyes! You see the tumbling waters, the river, the surrounding country, the tourists. You take the trip on the stanch little boat "Maid of the Mist." The thunder of the falls isn't in your ears nor the spray in your nostrils, but otherwise the illusion is perfect.

I was thrilled to my toes!

Sound and synchronization were excrable during the showing of the first half of the film at the premiere performance Saturday morning. Chances are, however, that whatever was wrong at that time has been remedied by now.

## Cell Surgery Motion Pictures Form Unique Demonstration

MOTION pictures of injections of measured amounts of fluids in cells so tiny that a pin point could crush many at one thrust, was one of the remarkable demonstrations included in the lecture on "cell surgery" (micro-dissection) as developed by Professor Robert Chambers, Chairman of the Department of Biology, New York University, and described by Dr. H. J. Fry, of the same department, recently before members and guests of the Science Forum of the New York Electrical Society.

Dr. Fry was discussing primarily the work of Professor Chambers in devising the means of handling these microscopic entities by means of the micro-manipulator, on which the latter has been working for many years, and with which he is beginning to achieve results of the utmost importance in biology—enabling him as it does to make close studies of the individual cell, that very basic unit of life on whose behavior depends so largely the health of the more complex living organisms, from insects up to man himself. Among other extraordinary examples of the work that has been done in this field of movies, Dr. Fry showed views of the dissection of red blood cells, which fade into invisibility the moment they are punctured by the microneedles; how white blood cells appear as tough and elastic as rubber balloons when caught on the point of the needles and pulled sharply apart; the unusual effect of impaling the nucleus of the tiny unicellular amoeba (an animalcule so small that it is not itself visible to the naked eye), and remov-

<sup>1</sup> M. P. Proj., August, 1929 issue.



ing it from the body of the animal itself; the manner in which an amoeba can pinch off a part of itself which may be injected with a toxic fluid such as calcium chloride, leaving the injured and dead part and continuing its ditch-water life apparently intact; and the violent contractions of a single striated muscle fibre, finer than the finest of silk threads, when subjected to the same micro-injection of calcium chloride.

### Thrilling Microscopic Films

Further demonstrating the striking potentialities of the motion picture in bringing before large groups of people the work of microscopic research, the UFA Films, Inc., leading German film company, showed a number of beautifully taken films of various microscopic material—especially impressive being those of the restless movement of bacteria in the human blood stream, and the eventual destruction of the red blood cells by the vicious little marauders. Both the germs of African sleeping sickness (trypanosomes) and those of syphilis (spirochetes), were thrown on the screen and shown darting hither and thither among the blood corpuscles, the trypanosomes constantly whipping their little sting-like tails, and the spirochetes wriggling about like so many evil serpents. In both cases, the blood cells eventually became broken or crenated suggestive of horse chestnut burrs and died.

One of the most beautiful of the German micro-photos was that of the Volvox, in which reel the crystalline transparent forms of the whirling colonies of these strange little creatures were shown upon the screen larger than footballs, although actually any colony of them could hide beneath the head of a common pin. The little "daughter colonies" within the mother one were clearly to be seen whirling in their turn in the confines of the larger organism. These daughter colonies, collections of single animalcules, would soon emerge from the mother colony, drifting off to act as mother colonies themselves, and leaving the one from whence they sprang to disintegrate and die.

### Picture Circulatory System

The UFA people also display some remarkably fine views of the circulation of the blood, including animated diagrams to show the mechanical action of the human heart and circulatory system. The pictures of blood corpuscles flowing through the foot of a frog, leaping forward at each heart beat, floating idle as the heart expanded, caused comment through the audience. The sap in plants, the breathing of plants, and the motion of protoplasm through the plant cells was so clearly depicted that a simple blade of grass became

a living colony of microscopic particles and currents, a whole bundle of restless energy within itself.

In showing what the motion picture could do for the natural history class, the German company gave two pictures of deadly battles which were amazing both from the standpoint of their subject matter and from the clarity with which the action of the principals could be studied. One of these was the struggle between an octopus and a crab, in which the octopus throws itself upon the crab with intent to kill, but eventually is beaten off and chased away by the crab's superior strength and strategy. To see these two strange combatants locked in a death grip under water is such a weird sight as one might expect in prehistoric times or in the tales of necromancers. When the octopus finally tears away and makes his escape under cover of an ink screen which he ejects, one is reminded sharply of the saying that "nothing is new under the sun," as he remembers the smoke screen strategy of today's wars.

Again, the evil-looking and viciously poisonous Jararaca, one of the most deadly snakes in the South

American jungles, is shown in combat with its worst enemy, a non-poisonous snake called the Murana. The Murana, having an armor of extremely hard scales, does not fear the bite of the Jararaca; so it proceeds to capture the latter by the tip of the tail and swallow it alive, ignoring completely the desperate stinging strikes of the wicked poisonous head which finally disappears down the gullet of the phlegmatic Murana.

The possibilities of this micro-dissection are so vast that workers in the field feel they stand only on the threshold of greater achievement in cell physiology and cell chemistry. Dr. Fry called attention to the fact that if we are now able to watch the behavior of the individual cell, test its electrical reactions (by means of micro-electrodes inserted by this same method of micro-manipulation, and a stimulation of the cell by a third element), inject known quantities of known chemicals and observe cell reactions to these, etc., that we most definitely should be able to count upon a vastly greater knowledge of life processes after a few years of such intensive and minutely exact experiment as this permits.

## Voltage Fluctuations in Sound Systems

By John J. Mucher†

**B**ECAUSE we refer to the usual lighting current as "110 volts," the source of considerable trouble in the operation of the usual sound system is generally overlooked. In other words, the so-called 110 volts may fluctuate over considerable limits, or actually from 85 to 140 volts, as a regular thing, while the projectionist wonders why he is either not obtaining the proper value from a sound system, or why he must replace tubes at very frequent intervals.

Line voltage fluctuation is something which is beyond the control of both the power consumer and the power company. At the generating station, it is simple enough to provide any desired voltage, irrespective of the load on the line. It is simply a question of regulating the generators, so as to obtain the desired potential. But out on the line, there are other factors and uncertainties encountered. For instance, the transmission line may be short or long, with more or less conducting capacity, thereby accounting for the greater or less drop in line voltage. Also,

the transformer equipment may be greater or less, accounting for the corresponding drop in the available voltage at the consumer end. Furthermore, the wiring of the building itself may be of greater or less capacity, resulting in more or less voltage drop, when vary loads are applied.

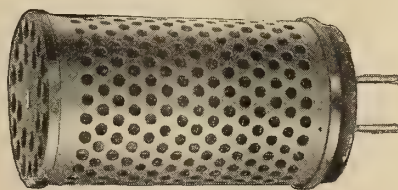
### Fixed Resistors Useless

If the line voltage were constantly high or constantly low, the problem would be a simple one to solve. It would be necessary only to introduce the proper resistance value in the primary circuit, thereby compensating for increased or decreased line voltage. However, line voltage fluctuations are constantly taking place, and in greater or lesser measure, so that no fixed resistor can serve the purpose satisfactorily.

In fact, the primary windings of most sound system power transformers are provided with variable taps, so as to compensate definitely for abnormal or subnormal line voltages. But such relatively fixed measures do little good when the voltage fluctuates from one moment to the next. Obviously, a flexible, *self-adjusting* series resistance must be placed in the circuit, which will immediately adjust its resistance value for the varying line voltage.

Several devices have been developed for this specific purpose and have found wide acceptance in the broadcast reception field. These devices take the form of automatic or self-

† Clarostat Mfg. Co.



Clarostat Regulator



adjusting resistors, the resistance of which varies according to the current flowing through them. Thus as the line voltage increases and more current flows through the winding, the resistance value increases so as to check the current, soon balancing the voltage increase. In this manner a more or less uniform voltage is supplied to the primary of the transformer.

#### Improved Regulators Available

In the past the automatic resistors or so-called ballasts have been rather fragile devices, with glass bulbs containing a gaseous atmosphere and a delicate resistance winding. In fact, the earlier forms were made of iron wire in a hydrogen atmosphere, which tended to make such devices highly explosive in the event of a leak in the gas bulb. More recently, it has been found possible, due to certain improvements in special alloy wires, to produce free air circulation regulating devices of compact and sturdy design. In fact, many line voltage regulator devices are in the form of a perforated metal case containing the special resistance winding supported on a mica and metal framework. Because of the free-air circulation, such a type is highly responsive to line voltage fluctuations, providing almost instantaneous protec-

tion for the accompanying apparatus and tubes. Such an automatic line voltage regulator may be made to handle any desired wattage and to provide regulation despite line voltage fluctuations of from approximately 90 to 135 volts. In other words, such a device will maintain the 5 per cent plus or minus voltages specified by tube manufacturers, as a condition of their guarantee.

There are many and obvious advantages to automatic line voltage control, in the satisfactory operation of a sound system. First of all, it is necessary to have reliability and uniformity of performance in anything which caters to the public's entertainment. The provision of a fixed and satisfactory operating voltage insures not only good tone quality, but ample volume and marked uniformity of performance. Also, a more or less uniform voltage insures the long life of tubes so essential to the economical operation of a sound system. Lastly, the proper operating voltage provides protection against filter condenser breakdowns frequently due to excessive line voltage. All in all, the proper line voltage is a most important consideration in the operation of a sound system and should receive due consideration on the part of conscientious projectionists.

## Visual Limitations and Wide Film

By David Levinson

**I**N advocating the wide film for general use in motion picture theatres, film engineers have been confronted with a difficult problem, the solving of which will hardly do more than to make of the wide film a novelty limited for showing on particular occasions in the larger and specially built theatres.

Many factors combine to make the future of wide films highly precarious. The ordinary motion picture theatre is not built to supply the essentials stipulated by the wide film. On presenting so large an object to focus upon as the wide film projects, and to get the proper reaction from registration upon the retina, the eyes require a greater object distance than they demand from the smaller film. Hence, there will be a marked tendency on the part of an audience viewing a wide film to pass up the seats in the front of the theatre (as they even do to some extent now), in favor of those in the back of the house, where the image on the screen will show up more clearly.

Furthermore, the inclination will be to move toward the center of the theatre, for with so wide a film to gaze upon, the important action will for the most part take place towards the center of the screen, and the balance of the film will have little to do with either depicting the story or

showing in detail the features of the individual actors.

The limitations of vision are such as to set up rather definite restrictions as to how far and how well we can see at certain distances and under certain conditions. Insofar as the screen object projected by the wide film is concerned, the confines of direct and indirect vision, and the field of vision itself, can be expected to apply themselves as rigidly as they do in other instances. This being the case, direct vision must be depended upon to provide the important conceptions of color, form, size, and distance, and it is questionable whether it will be possible to provide with the wide film the factors that induce satisfactory conceptions, unless a sacrifice is made in valuable house space in order to give the proper object distance to the patron who must be seated up front.

If such object distance is not maintained, the patron, in order to take in what is going on in front of him, will have to shift his head from point to point because he is too near the enlarged screen and the object distance is so close that "but a small portion of the object can be seen clearly at a given moment," a reaction known to be absolutely authentic.

Indirect vision is concerned with the perception of direction, position, and motion, and inasmuch as this

type of vision is confined to that portion of the retina ("the third coat of the eyeball adapted to receive the impressions of light"), outside of the macula (the most sensitive part of the retina), the stimulus required for reaction of the eyes and brain need not be so definite, so that it is not very likely that the increase in size of screen object will affect indirect vision as seriously as direct vision.

It is only natural to believe that the system that the average moviegoer employs in observing a picture on the screen is to utilize direct vision in looking directly at the center of the screen, and with his indirect vision take in the other surrounding details. On the smaller screen, this was quite possible, for with the object distance and object size in correct proportion, the field of fixation ("the greatest angular distance over which the visual axis can be moved, the head being stationary") was under a minimum strain; but with the wide film and the normal value of side-movement of the eyes being but 45 degrees, it is easy enough to realize just how little of the sides of the wide screen a person will be able to see clearly without moving the head. In other words, the wide film provides too much territory for a pair of eyes to examine carefully, especially over a period of time equal to the duration of a modern picture show.

From the standpoint of visual limitations, the wide film does not have a particularly bright future. If enlarged in moderation, making the screen perhaps one-third larger, the wide film may prove attractive, but to go further than that will hardly be practicable. To make an audience look at a moving spectacle for an hour or more at a time, without including the third dimension, is bound to prove tiring to the eyes, and a restless audience can hardly be expected to react favorably to even the finest acting.

#### S. M. P. E. Committees

Appointments for the personnel of the committees to serve the Society of Motion Picture Engineers for the following year have been made by J. I. Crabtree, president. The committees and their chairmen are as follows: Color, W. V. D. Kelley, DuChrome Film Systems, Hollywood, Calif.; Convention, W. C. Kunzmann, National Carbon Co., Cleveland, Ohio; Membership, H. T. Cowling, Eastman Kodak Co., Rochester, N. Y.; Papers, O. M. Glunt, Bell Telephone Laboratories, New York, N. Y.; Progress, G. E. Matthews, Eastman Kodak Co., Rochester, N. Y.; Publicity, W. Whitmore, E. R. P. I., N. Y.; Historical, C. L. Gregory; Sound, H. B. Santee, E. R. P. I., N. Y.; Standards, A. C. Hardy, Mass. Institute of Technology, Cambridge, Mass.; Studio Lighting, M. W. Palmer, Paramount-Famous-Lasky Corp., L. I. City, N. Y.



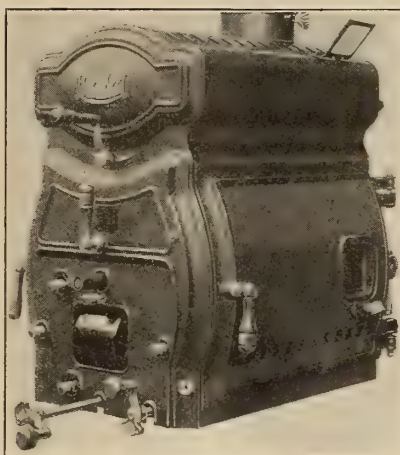
# New Brenkert High Intensity Lamp

**B**RENKERT has introduced and is now installing a new high intensity lamp for projection work. Certain features in the design, construction, and operation of this new lamp are sure to exert a large influence in the projection field. Optically, mechanically, and electrically, this new Brenkert lamp embodies the latest advances in the art. The lamp is an addition to the Brenkert line of lamps and effect machines, and it is equally suitable for projection of either standard or wide film.

Outstanding among the many unique features of this new lamp are (1) the 'unit feature'; (2) entire mechanism fully enclosed; (3) easy accessibility; (4) lubricating provisions; (5) high standard of quality in all materials; and (5) performance, in which better results at lower cost are secured.

Of particular appeal to projectionists is the fully enclosed mechanism feature, insuring long life and best performance as a result of all moving parts being shielded from dirt and dust. Brenkert cites the following advantages of this new lamp.

More light per ampere. In these days of extremely high amperage, this new lamp is rated to give ample illumination or even the larger screens with only 120 amperes current. The light obtained is said to be a whiter light, and an even illumination from edge to edge with no appearing and disappearing shadows is obtained. Rigorous tests in several theatres over



Rear view, showing controls

a long period of time have substantiated the claim of the manufacturer that the lamp will give uniformly satisfactory results whether the screen picture size be 21 feet or 40 feet, and on all intermediate sizes.

## Design and Construction

In addition to all-enclosed feature previously cited, there are many other features of design and construction of this new lamp which will find favor with the projectionist. A special lubrication procedure has been worked out by Brenkert which will insure positive lubrication for all moving parts and will be conducive to long life and top-notch performance by the affected parts. All mechanism parts

are easily accessible for removal, and replacement may be made with comparative ease and accuracy.

The entire feeding mechanism has been planned with extreme accuracy, both on the continuous feed and rotation of the positive carbon and on the intermittent feed of the negative carbon. Provision has been made for independent adjustment of the negative feed with micrometer accuracy with more than the needed range.

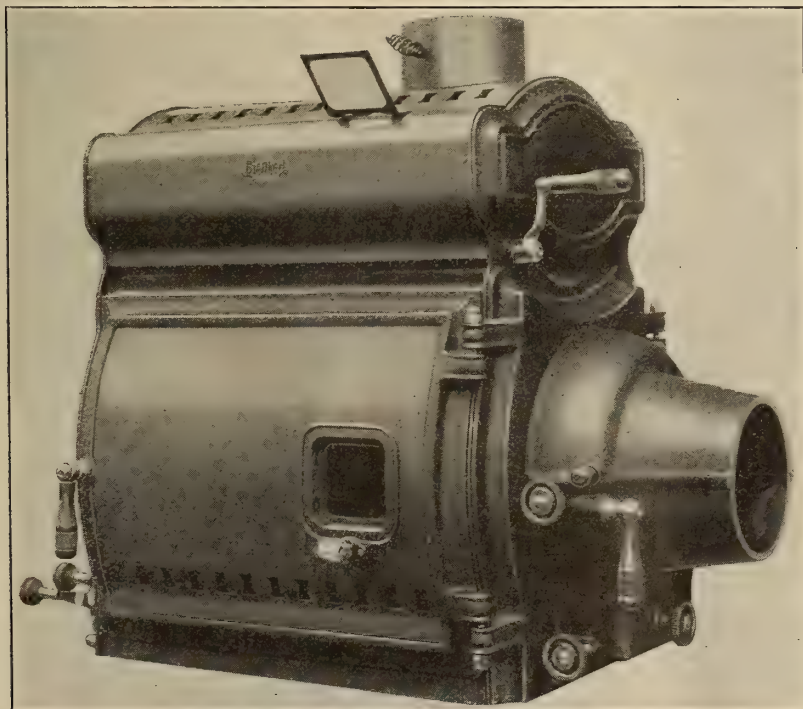
Condensing lenses may be adjusted accurately and conveniently for focusing purposes, and the lenses are separately removable from the outside of the lamphouse. Condensing lenses of radical departure from existing sets enable the new Brenkert lamp to produce eminently satisfactory results.

The new lamp accommodates 20" long positive carbons and insures a continuous feed for this entire length. The negative carbon is 9" long. The contact jaws are quickly removable without any necessity for detaching the electrical connection wires.

The unit feature of this new Brenkert lamp represents a distinct advance in lamp engineering practice. The lamp really is a group of individual units—the whole perfectly coordinated so as to give the very best results. Positive head unit, negative unit, control unit, condenser unit, and the entire lamphouse may be taken off and put on again in but a few minutes time, without the necessity for making or changing any adjustments. Replacement of all parts is immeasurably simplified by this unique construction. Separate manual control handles for positive and negative carbons insures ease of operation irrespective of whether the lamp is hot or cold. A special arc visor accurately showing the positions of the carbons is provided.

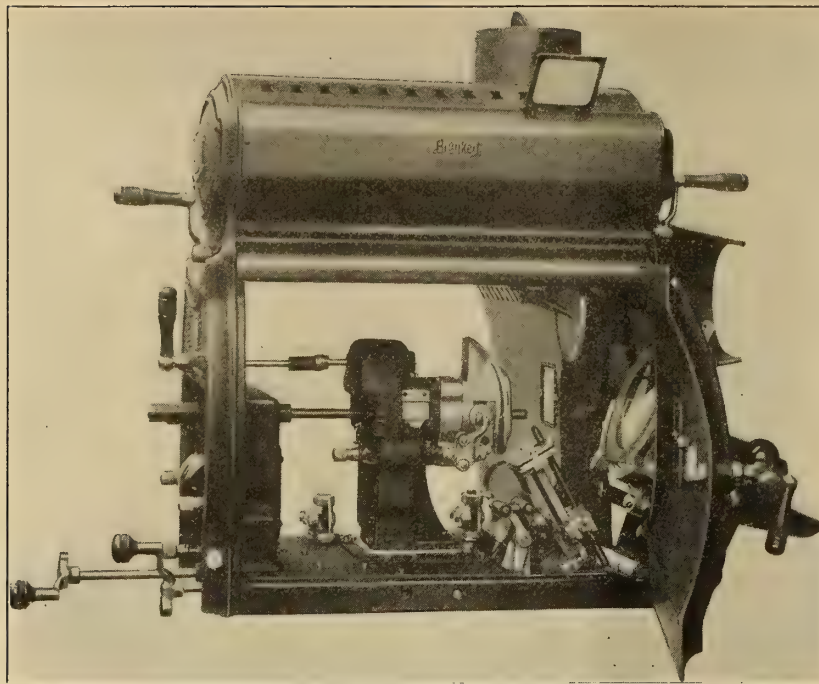
A new type of automatic arc striker, of Brenkert design, is a very important feature of this new lamp. The striker is fully automatic and an important exclusive feature is that it operates equally well when striking at either high or low current. This important feature means that the arc can be struck at low amperage and increased to full operating amperage by use of the booster switch. Some projectionists prefer to strike the arc at full amperage and this can be done with the Brenkert automatic striker with assurance that no damage will result to any part of the mechanism. This unique arc striker also permits the carbons to be trimmed in normal burning position.

The removal and replacement of only four small parts, which is very quickly done, permits the insertion and use of the 16 mm. carbon combi-



The new Brenkert high intensity lamp





Side view of lamp, showing mechanism

nation for those who desire to use this size for the projection of wide film.

#### Specifications—Model A

##### For Standard Film Projection

A800. Brenkert super high intensity projection lamp complete as illustrated ready to operate for using 13.6 M.M. positive and 7/16" negative carbon. Includes one extra lead wire for positive contact jaws, one extra lead wire for negative carbon contact, asbestos wire connections from lamp terminals to picture machine switch. One point special lubricant for positive and negative heads. *No condensing lenses.*

A802. Brenkert super high intensity projection lamp. Same as above except equipped for using 16 M.M. positive and 1/2" negative carbons.

810. One set contact jaws for 13.6 M.M. carbon.

A811. One set contact jaws for 16 M.M. carbon.

A812. Negative carbon holder for 7/16" carbon.

A813. Negative carbon holder for 1/2" carbon.

A814. One set drive rollers with retaining pins for 13.6 M.M. positive carbon.

A815. One set drive rollers with retaining pins for 16 M.M. positive carbon.

A8. Brenkert large aperture rear condensing lens, heat resisting, ready to mount in lamp.

A10. Brenkert large aperture front condensing lens, heat resisting, ready to mount in lamp.

The Brenkert super high intensity lamp was designed by Brenkert engineers, is made complete at the Brenkert plant and carries the full warranty of that company. It is manufactured under the high intensity arc patents of General Electric

Company and Brenkert patents pending. A complete illustrated manual for assembly and best operating results accompanies each lamp and assures best performance.

Among the theatres where the new Brenkert high intensity lamp is already installed are the *McVickers* and *Oriental*, in Chicago; the *Paramount* and *Michigan*, in Detroit; and the *Strand*, in New York.

#### Range of Audio Frequencies

Cycles per Second	REMARKS
32,768	Beyond limit of audibility for average person.
16,384	Telephone silent with 40 volts on receiver terminals.
10,000	Considered ideal upper limit for perfect transmission of speech and music.
8,192	Highest note on fifteenth stop.
5,000	Considered as satisfactory upper limit for high quality transmission of speech and music.
4,096	Highest note on pianoforte.
2,560	Approximate resonant point of ear cavity.
3,072	
3,000	Considered as satisfactory upper limit for good quality transmission of speech.
2,048	
2,000	Maximum sensitivity of ear.
1,500	Mean speech frequency from articulation standpoint.
850	
800	Representative frequency telephone currents.
600	
426.66	Orchestra tuning.
256	
200	Considered as satisfactory lower limit for good quality transmission of speech.
128	
100	Considered as satisfactory lower limit of high quality transmission of speech and music.
80	Lower note of man's average voice.
64	Lowest note of 'cello.
60	
32	Lowest note of average church organ.
30	Considered ideal lower limit for perfect transmission of speech and music.
27	Lowest note of pianoforte.
25	
16	Lowest audible sound. Longest pipe in largest organ.

## H. M. Wilcox Is Elected to ERPI Directorate

At a recent meeting of the directors of Electrical Research Products, Inc. Herbert M. Wilcox was elected Vice President in charge of operating. The election becomes effective January 1, next. Mr. Wilcox has been Operating Manager of the company, having had charge in that capacity of installing and servicing Western Electric sound picture apparatus.

For eleven years Mr. Wilcox was associated with the Winchester Repeating Arms Co., New Haven, Conn., where he was Industrial Engineer, and during the World War was in charge of production in the cartridge department. Joining Western Electric in April, 1926, as Commercial Manager, he was shortly thereafter loaned to the Vitaphone Corp. in the same capacity. When Electrical Research Products Co. was formed in January, 1927, Mr. Wilcox went along with the new organization as Operating Manager.

#### Saw ERPI'S Rapid Growth

In this latter connection he has seen the department grow from an embryo nucleus of 6 to a present day nationwide organization with a personnel of 1,250. It maintains offices in 38 cities from which are served some 4,800 theatres equipped with W. E. sound systems. Merchandise stocks, installation, and other operating functions also come under his jurisdiction.

Electrical Research Products' new Vice President was born in Pittsburgh 48 years ago. He attended Princeton University and Massachusetts Institute of Technology, graduating from the latter in 1905 with the degree of B. S. in Chemical Engineering. Mr. Wilcox has made a host of friends in the sound picture field throughout this country and Canada through which he has traveled frequently in connection with his ERPI duties.

## W. E. vs. Amplion Corp.

Western Electric Company has entered suit in the United States District Court for the Southern Division of New York against the Amplion Corporation of America and two of its officers, John W. Woolf and William L. Woolf, who are also distributors for the company.

The suit calls for preliminary and final injunctions, as well as an accounting, and charges unfair competition and patent infringements on two patents held by Western Electric Company on dynamic speakers for theatrical uses.

These two patents were held valid by a decision handed down in the United States District Court of the Western District of Michigan, Southern Division in October 1930 in the case of Western Electric against Kersten Radio Equipment, Inc.



# Screen Characteristics and Natural Vision

By L. M. DIETERICH, PH. D.

THE broad limitation imposed upon the author for the purpose of this article, is to consider only the psychological difference between natural vision relating to the two-dimensional pictorial art on one side, and the natural vision relating to three-dimensional reality on the other. The following analysis will show that a really analytical study of human vision relating to motion picture screen characteristics, comprising rectangular shapes only, their proportions and sizes, must include the elements within the mentioned broader limitations, to be of any conclusive, even if only hypothetical, value.

The shape of the screen has throughout the existence of motion picture projection simply been an enlargement of the film picture frame or a rectangle of the proportion of 3 to 4. Its size was and has been fundamentally governed by the grain conditions of the film picture and also slightly modified by local theater conditions, i.e., optical efficiency of projection machine, throw, screen surface characteristics, illumination, minimum screen distance, etc., etc.

The selection of the present size of a film picture frame and its proportions was simply an arbitrary selection by Edison and Lumiere for economical and practical reasons. After both Edison and Lumiere adopted the four-hole perforation, the present frame size became, through their absolute control of the early film market, a standard.

If during the years of motion picture development artistic minds suggested a reconsideration of frame proportions and film sizes, their efforts were, on account of the commercially and universally adopted standards, fruitless. It was only lately, when the introduction of sound-on-film methods robbed the picture frame of a considerable part of its width, that a change of film and frame dimensions became imperative. Technicians began to study the problem energetically, and the selection of a new standard was sought for. The correlated screen size became an important part of this problem.

Unfortunately the searching work of the technicians was only a study of statistics of the pictorial art. The rectangular limitations or the framing of a picture were accepted without discussion. The work of the old painting masters was searched and studied. The proper artistic proportions of rectangular framing were studied, going for support and study even as far back in history as to consider architectural proportions of the "rect-

angular" in the classical art. Hellenic art was accepted as *the* art of the ages and there the research work started.

## 5 x 8 Proportion Best

The excellent and exhaustive work of Lloyd A. Jones, C. L. Gregory, W. B. Rayton, A. S. Howell, J. A. Dubray, F. Westerberg, and others, brought about the so-far unrefuted result: that a 5x8 proportion of a picture frame rectangular conforms most closely to the rectangulars appearing in the outstanding records of beauty in the known history of art. The author has failed, however, to see or hear of any research endeavoring to find the psychological background for the establishment of the 5x8 proportions by the "masters."

We have no statistics, no records dwelling on this point. If we, however, are justified in assuming that art depends upon the creation of "significant form" (see Clive Bell), we are also justified to assume that that significant form, as conceived by the creative mind of the artist and recorded by his skill in visual form—was originated by the impressions and nerve reactions of the artist's eyes, and that his work also, becomes of importance and value only by visual inspection. To study screen sizes and proportions from the ground up, we are therefore forced to first study the optical characteristics and psychological reactions of the natural human vision.

It may be considered unfortunate, that commercial eagerness selected lately more or less arbitrarily a few shapes and sizes, before art, science and engineering had the opportunity to harmoniously develop and recommend a new standard, and that certain exponents of the industry so vigorously supported this secretly developed innovation with unlimited capital and most energetic technical and commercial activities, that we are facing a similar situation as that created by Edison and Lumiere years ago.

To return to the human endowment which is the basis of all artistic conceptions, endeavors and work—natural vision.

## Natural Vision

It is of elemental necessity to first thoroughly understand what natural vision is, its psychological characteristics and physical limitations.

There is a vast difference in the structure, efficiency and the nerve reactions, between the optical system of the different species of the animal kingdom. Let us consider for the purpose of this article, with due

apologies to the exponents of religious philosophy, and solely from the optical point of view, man as the mentally highest type and only truly upright specimen of the ape family.

There are even between the ape's and upright man's optical systems differences, solely the results of evolutionary adaptation to the mode of man's normal physical behavior. The normal upright position of man evolved characteristics of his optical system, which are best described on hand of Fig. 1 (next page). The normally upright posture of the head developed the normally horizontal position of the optical axes of his eyes.

Without going into the progressive results of evolution, determining its details, the field of vision is shown for the right and left eye. The parallax or horizontal distance between the two eyes (about 70 mm.), has been disregarded in this diagram, because it disappears, as far as its effect upon the field of natural vision is concerned, if we consider only distant, converging vision; an assumption, justified for the scope of this article.

We observe, that the field covered by the vision of both eyes, is approximately heart-shaped, with two lobes attached on each side, extending downwards and representing the vision of the single eyes only. The axes of the two eyes are both projected upon the center of the diagram.

The totality of vision, however, extends from this center more downwards than upwards, and a rectangle, closely following the outlines of vision totality, shows a dimensional proportion of very nearly 5x8 (see dotted rectangle).

This totality of natural vision, for a normal human eye, is of course only correct for a fixed position of the head. Analyzing our viewing a screen picture, we can consider this condition only, as the movement of the eyeball is very much more rapid, than that of the head.

There are, however, within the range of eyeball motion also zones of comfort and discomfort, extending from consciously effortless ranging of the optical axis to its deflection by perceptible muscular effort or even painful strain. Considering the most important direction or meridian of vision, i.e., the parallactic or horizontal range of vision, we find that the extreme, covered by painful muscular exertion, covers in the average about 100 degrees on each side. This zone is, however, only relating to the respective single eye. The next zone, covered in its extreme by perceptible



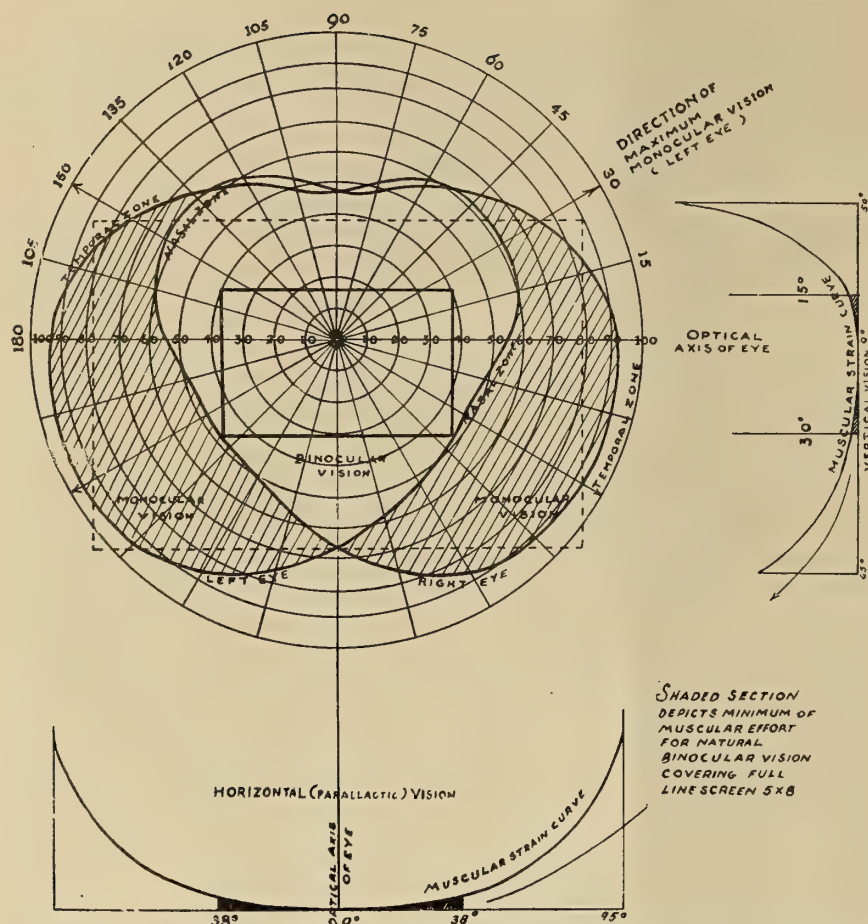


Figure 1. Perimetric diagram of binocular and monocular fields of natural vision of the normal human eye

muscular effort, covers about 70 degrees on each side, whereas the consciously effortless range of vision of both eyes, covers theoretically about 38 degrees on each side.

In actual, every-day natural vision, both eyes cover horizontally about 30 degrees on each side, or we have an effortless view of about 60 degrees in the horizontal meridian.

In the vertical meridian the effortless vision extends to about 15 degrees upwards and about 30 degrees downwards; this is a classical result of evolution of the human optical system—following the normal movements of upright man on the ground, with most attention necessary for obstacles or dangers, characteristic of the ground he walks upon.

The diagrammatic curves of muscular efforts for the deflection of the optical axis of the human eye from its normal position, looking "straight forward," shows the geometrically increasing energy, necessary to look "sideways, up or down" to the limits of vision. They also show the nearly effortless instantaneous covering power of the eyes for binocular vision, 15 degrees up, 30 degrees down, 38 degrees each side.

If we inscribe into these limits a rectangle, we find it most closely expressing a dimensional proportion of 5x8. It has been of singular interest to the author, to find that the results

of his research work in natural vision, simply on a basis of analytical logic (abstract as far as screen sizes are concerned), coincides with the results of statistical research, so thoroughly conducted by others.

It may be of interest to consider here for a moment the reason, why pictures are usually contained within "rectangular" borders, when we know the actual peculiar curved border line of natural vision.

Our earliest records of primitive pictorial art show no border lines. We find borders only when architectural art was sufficiently developed to show beauty in "significant forms," characterizing the various epochs in architecture, be they Chinese, East Indian, Babylonian, Egyptian, Hellenic, Mayan or others. The hard material used for the edifices constructed under these different significant forms, forced upon the early artist, the characteristic human deviation from nature—the straight line.

In the design of the earliest monuments, there naturally appeared surfaces, bordered in their simplest and most impressive contour, by straight lines, as rectangles.

If the predominant proportion of height and width in the most "beautiful" examples of classical architecture of 5x8, was the result of the innate sense of beauty of the builder—if it was his endeavor to follow the effort-

less range of vision of his eyes—designing and correlating his system of beautiful proportions for a definite viewing distance—we do not and never will know. Fact is, however, that these proportions were established in the progressive architectural arts. Fact is also that there came a time, when such surfaces were embellished by a variety of designs in order to cover their plainness, a time, when pictorial art was called upon to beautify these surfaces.

Of our earliest records of pictorial art, mural paintings fall within this class. It was not a question for the painter to design a fitting border for his composition. The question was to compose his picture for an already existing border line. The esthetic pleasure, produced by the viewing of such "beautiful" forms, associated the combination of paintings and rectangular borders for all times, as a necessary basis, for all future artistic endeavors in pictorial art.

A rectangular border of 5x8, as an absolute "necessity" for finished beauty in a picture, is successfully contradicted, however, by the fact, that we have a great many masterpieces, especially in movable paintings, which, although mostly rectangularly framed by no means show the 5x8 frame proportions, but follow the concept of composition, to whatever frame proportions the sense of beauty of the painter selected.

Even today, the director and camera man have to exert more than ordinary artistic efforts, to always cover the unchangeable frame area with beautiful compositions.

The foregoing statements seem to indicate that a 5x8 motion picture frame should best cover all artistic and esthetic demands. The actual size of the picture to be shown on the screen, however, is governed by more complex conditions.

The underlying condition is always the limitation of effortless natural vision without head movement. If such condition is covered, then the picture is "easy to look at"—it can be viewed with the maximum of comfort, and the public is pleased (in this respect).

### Show Old German Films

The recent November program of the Wintergarten, Berlin's oldest variety theater, with its famous "starry heaven," is showing "living pictures" that were shown on the same stage thirty-five years ago as the first exhibition of motion pictures ever seen according to a press dispatch. Max Skladanowsky, their inventor, was present at the first performance.

These first films had an average length of four to six yards, with one "big film" twenty-two yards long. The first projection apparatus, which Skladanowsky called a "bioscope," makes so much noise that it almost drowns out the orchestra.



# Efficient Sound Reproduction

By R. H. McCULLOUGH

*Supervisor of Projection, Fox West Coast Theatres*

**E**VERY component of an amplifier is designed to operate under certain conditions and when any of these conditions is varied, the efficiency of the unit to perform its function is affected. It is the function of the amplifying circuits to build up the intensity of the feeble currents induced in the reproducer. A partial failure of any part of the amplifying network is perhaps the most logical place to look for the cause of intermittent weak reproduction. An excellent preliminary for shooting trouble in case of low volume, is to determine the age of the vacuum tubes.

Short vacuum tube life may be due to one of two causes: (1) Some tubes are burned out by the current surge when the switch is closed. A good tube is relatively immune to this temporary excess of current, or so designed in accord with principles, so that the surge is reduced to a negligible peak. (2) Incorrect operating potentials, i. e., high filament voltage, low "C" bias and high plate voltage. When A. C. current is used to heat vacuum tube filaments, the line voltage should be checked carefully.

Poor line regulation may cause disastrous fluctuations. Check the line voltage at peak and low periods, and install a voltage regulator, if necessary. Excess filament voltage burns

out the vacuum tube. Excess plate and low "C" voltages generally kill only the emission, however, the tube still lights.

## Vibration

There is always a certain amount of vibration with the motion picture projector, which is inevitable. It is true that the photo-electric cell amplifier is suspended on suspension springs in such a manner that vibrations are reduced to a minimum. Vibrations become electrically bothersome in the case of microphonic tubes, and painstaking selection is occasionally necessary with an exhaustive shifting around of tubes. If it were possible to mount the photo-electric cell amplifier on a pedestal directly below in front of the projector mechanism in such a manner that it would not be attached to the projector, many troubles would be eliminated, which are now encountered with the p. e. c. amplifier due to vibrations. In doing this, it would be imperative to keep the p. e. c. lead as short as possible.

Excessive heating of rectifier tubes is usually caused by a short circuit in one of the filter condensers, or by an internal short circuit in the power transformer. Excessive hum may be traced to certain conditions in the theatre lighting circuit or to defects in the amplifier, such as a grounded

filament wire, a short circuit in the power transformer, or a defective vacuum tube, which applies when alternating current is used to heat vacuum tube filaments.

It is well to keep in mind that if the energy entering the amplifier is distorted, it will be carried throughout the entire reproducing system. The voltages should always be steady—if otherwise, slight variations will be amplified, which will produce harsh reproduction. If a squeal or howl is encountered with the 8-B or 9-A amplifiers, check "C" batteries to ascertain continuity of circuit.

When shooting trouble and where it is not desirable to scrape the insulation from the wires, considerable time may be saved for testing the continuity of circuits by taking an ordinary steel sewing needle and sticking it through the insulation until a contact is made with the wire, which permits satisfactory testing.

## W. E. Fader

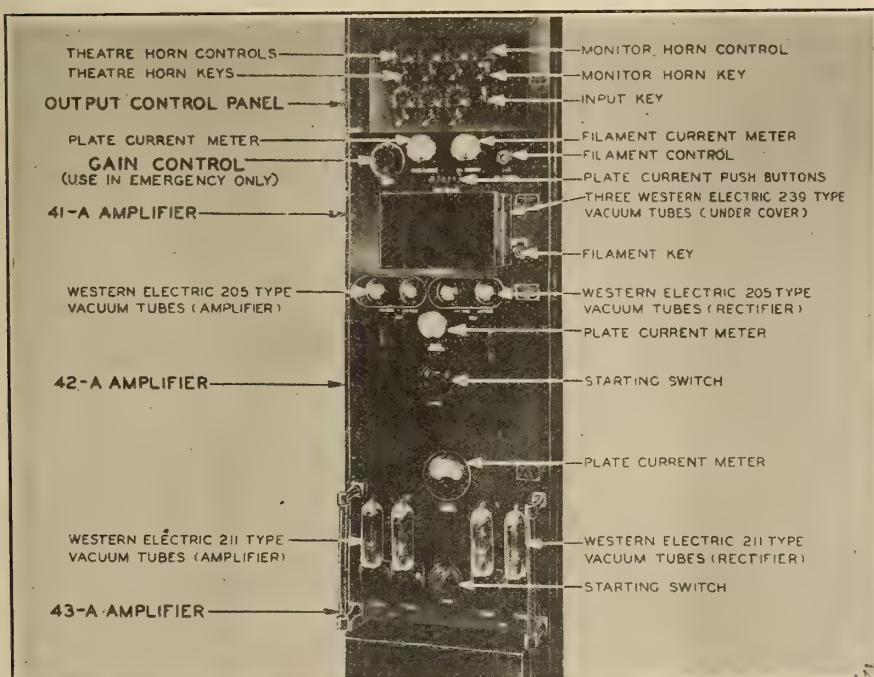
The Western Electric Fader has given us very little trouble. However, one of the things which has occurred has been that one-half of the fader would short out, leaving the one projector without means of controlling the volume. The output from each projector runs to the fader. If one side of the fader should short out, it is possible to change the output over to the other side of the fader and run both projector outputs to one side of the fader. If this expedient hook-up is made, it is very important that the fader be brought to zero on changeovers.

## Function of Fader

The Western Electric fader plays three important parts. First, it is used for making changeovers from one projector to another. As you get to the end of the reel the fader is brought down on the outgoing projector, which diminishes the sound to zero and the sound on the incoming projector is brought up to the same volume level as the outgoing projector. If the fader is handled properly, the entire operation is done so quickly that it is not perceptible in the auditorium.

The second important part which the fader plays is controlling the volume. The third use of the fader is for matching impedances. It is quite evident that the output of the 49-A amplifier does not have the same impedance as the input of the 41-A amplifier, which is a speech amplifier. If the output impedance of one

(Continued on page 22)



W. E. 200—A panel, the horn panel is shown at the top; then the 41-A, 42-A, and 43-A amplifiers



# As *The* EDITOR Sees IT

## N *■ The Wide Film Situation*

NINETEEN thirty-one lies but a few days ahead of us and still the situation with respect to wide film remains unchanged: its introduction on even a limited scale is still a promise, the same old promise that was held forth in 1928, '29, and '30. The great interest which attaches to this question of wide film is evidence by the fact that the bulk of our correspondence these days is concerned with this topic. "When?" is the pressing question.

One hears much talk of the "technical difficulties" attendant upon the introduction of wide film, but we are inclined to the belief that such talk is done mostly by the uninformed or by those who, knowing better, are not adverse to thickening the smoke screen. Who can say with assurance that the technical "problems" offered in connection with wide film are any more difficult of solution than were those associated with sound pictures? An industry with a record of accomplishment in the latter enterprise to its credit cannot be considered as "stumped" by wide film. The answer lies elsewhere. Let us consider briefly the mileposts already passed in the progress of wide film.

Grandeur has made its bow; Spoor-Berggren has been exhibited; Publix has demonstrated its process; M-G-M has ballyhooed "Realife"; Warner Bros. Co. is busy with a complete producing and reproducing apparatus—and several others have made important contributions to the art. In none of these systems were there any inherent technical defects which would prevent its introduction on a wide scale. In short, the answers to all requirements for wide film are at hand. What, then, is the real answer? Recent developments have proven the accuracy of a previous estimate of this situation: the answer is "money."

A recent survey indicated that sixty per cent of all the theatres in America could not install wide film without extensive and expensive structural alteration. This item in itself would be sufficient to impose a serious check on wide film development. This expense would be in addition to the costs of making the change from present equipments to wide film equipments. Some there are who advocate the use of attachments, which move would permit the use of existing equipment. Attachments do not appeal to us as a satisfactory solution to this problem; but even if we were proven wrong on this point, the cost of such attachments would be more than the average theatre could stand—just now. The industry still owes too large a sound picture bill, and the assumption by it of an additional bill for some forty millions of dollars (a fair estimate of the cost of wide film), will hardly improve its financial condition. Wide film is ready today; but who will pay the costs? Technicians haggle and sputter about "standards," but a standard would be forthcoming immediately following a nod of approval on costs from the front office.

We come now to another consideration. How many are there who want wide film? We don't, for one. We are opposed to any dimension over 50 mm., and in fact would prefer to see a standard of about 45 mm. agreed upon. Outside of Hollywood, how many 52-foot bathrooms are there? And will a pulsing love scene be enhanced to any considerable degree by the addition in the set of a few extra tons of furniture to fill in, or, in an exterior, by the inclusion in the scene of miles of rolling countryside. But these are trifles. More important is the fact that the public has demonstrated by its complacent reception of recent wide film presentations that here certainly is not the great box-office tonic that was originally sold to the motion picture industry. New York, Chicago, and Hollywood proved that.

More than two millions of dollars have already been expended for wide film equipment—cameras, projectors, lenses, screens, and other special apparatus. We know of the existence of twenty wide film projectors ready to run today, if needed. The supply is ready. Who will create the demand?

## O *■ One-Man Sound Projection Shifts*

OUT in Chicago, that town of big winds (natural and otherwise), an exhibitors' association has uncovered for the benefit of their embattled brothers throughout the country that old familiar exhibit of how labor unions can put an entire industry on the skids. One portion of this exhibit is devoted to the findings of a recent survey (conducted by the exhibitors, of course), which tend to show that many theatres are in the red each week by approximately the amount that goes to make up the salary of the second projectionist in the house. Logic, then, dictates the answer: a cure may be effected by dispensing with Mr. Projectionist No. 2. Simple.

No mention is made of the fact that the prices for bad pictures which couldn't draw a handful into a theatre at ten cents each are exorbitant; no survey was made to ascertain if modern methods of showmanship are employed; no relief from high rentals is asked; no suggestions for perking up the theatre from the standpoint of its physical appearance or program fare is made. Why? Because, in simple language, "they knew what they wanted"—beforehand.

It has been demonstrated time and again that no theatre may offer an acceptable sound picture show with only one projectionist. By dispensing with a second projectionist these exhibitors will soon learn that they will have no show to sell, for the quality of their reproduction will suffer. This is no propaganda in favor of the Local Unions; they should know their business by this time. But any Local Union which countenances a one-man sound picture crew proposition is hurting not only itself but the industry at large.





## *New Year Greetings*

*from the*

## *International President*

IN sending the greetings of a new year to the rank and file of the projectionists of America, I am fully conscious of the hopes and aspirations of the thousands of men who go to make up our great organization—an organization founded upon the principles of service and ideals for a better life, a better comradeship, and a finer understanding and co-operation between ourselves and our employers in all that is of mutual advantage.

Trade unionism is not the handiwork of the poet, the philosopher, or the dreamer; sheer practical economic necessity is always the primate from which germinates the desire for industrial organization in the form of trade unionism by any group of craftsmen.

The formula is as old as the pyramids,—the result an unending progression of achievement ever in a state of flux.

Accomplishment being measured only by that devotion to ideals and principles, free from individualism or selfishness which are man's highest expressions of freedom and a democracy. We should dedicate our purposes to a finer craftsmanship that will prepare us to meet every test of proficiency whenever called upon in the rendering of that service in an exacting manner to the industry in which we are engaged.

Our motto should ever be "The High Standards of Projection Excellency Have no Limitations."

When higher projection standards have been attained such results should only signify the necessity for the closest application of projectionist's craftsmanship in improving upon that which has already been improved.

In retrospect we can trace the development of projection room equipment and projection practices from a crude and humble beginning through the various stages of its advancement to the present state of perfection. In view of what has transpired with the quickening pace of the on-rushing years, surely the projectionist must prepare himself and be prepared for the newer and greater responsibilities in the handling of intricate projection room equipment now being developed in the research laboratories.

Projectionists have every reason to be proud of the service they have rendered to the motion picture industry. I know they will not be found wanting when called upon to face the projection problems of the future.

That a bountiful New Year may have in store for the organized projectionists of America unlimited happiness, peace, prosperity, and contentment, is my earnest and sincere wish.

*Wm. J. Cammarano*



# Efficient Sound Reproduction

(Continued from page 19)

amplifier is different than the input impedance of the preceding amplifier, it is necessary to insert some form of apparatus or series of resistances to match up the impedance. The fader plays this part.

It is quite true that in any electrical circuit, the most efficient transfer of energy between two pieces of apparatus gives more efficiency if the impedance is equal.

## Fader Contacts

Fader contacts must be inspected quite frequently, cleaned with carbona, polished with a good grade of fine paper and lubricated very slightly with vaseline. Dirty fader contacts are very noticeable in the form of popping and crackling noises when changeovers are made or when increasing or decreasing the volume.

## Capacity

Capacity is the ability or power of anything to receive or to contain electricity. The capacity of a condenser or other device is the amount of electricity or the electric charge that it will receive and hold. The unit of measurement for capacity is the farad, but capacities used in amplifier circuits are so small that the practical unit in this field is the microfarad which is one-millionth of a farad.

A condenser which will receive and hold one coulomb of electricity when a pressure of one volt is applied to its terminals has a capacity of one farad.

## Battery Care

When a battery is charging, hydrogen gas is liberated, especially at the end of the charge. This gas fills the space in the cells above the electrolyte. It is highly inflammable, and if ignited, may cause considerable damage. A flashlight or an electric lamp on an extension cord should always be used rather than to take a chance with a match.

Overheating of a battery may be caused by too heavy a rate of charging, by insufficient electrolyte, or by internal short circuits in the cells. The plates become buckled or broken, and this may in turn cause the insulators to break, permitting adjacent plates to touch each other, which also causes a short circuit. Besides warping the plates, overheating may cause the material on the plates to shed and drop away from the grids. Furthermore, overheating causes the electrolyte to get hot, which results in excessive sulphation of plates and also causes the electrolyte to evaporate quickly, resulting in a low level.

Corrosion, which collects on the battery terminals, especially on the

positive terminal, destroys within a short time the leads connected to it. This corrosion copper sulphate is either a green-colored paste or a chalky substance. To prevent corrosion from accumulating, the battery terminals should be carefully cleaned at regular intervals with a solution of ammonia and water, or a solution of ordinary baking soda and water in the proportion of one tablespoonful of soda to every 3 oz. of water. After the terminals have been wiped clean and dry, a coating of vaseline or ordinary cup grease should be applied. This coating will prevent subsequent corrosion. Do not apply the vaseline or grease to the terminals while the leads are disconnected, for after replacing them, it will be found that the grease is also an effective insulator, which prevents a good electrical contact of the wires to the battery terminals, with the result that no current can be obtained.

Corroded leads on storage batteries generally make poor contact, forming a high resistance joint, which may cause crackling noises in the reproduction.

Practical methods of correcting troubles that require plenty of experience to learn, can usually be told in a very few words. The projectionist who makes use of not only his own methods of procedure, but the accumulated practical experience of others, can accomplish more in less time. Troubles that occur to one projectionist may not happen to another; however, always be alert for anything to happen to sound reproducing equipment.

It is quite evident that a certain amount of vertical needle pressure is

necessary to provide proper tracking with records; as a consequence, records must be made of hard material and they must be abrasive enough to stand this pressure. Never use soft tone needles because they have a very poor frequency response, and the characteristics indicate that the higher frequencies are eliminated.

## Disc Reproduction

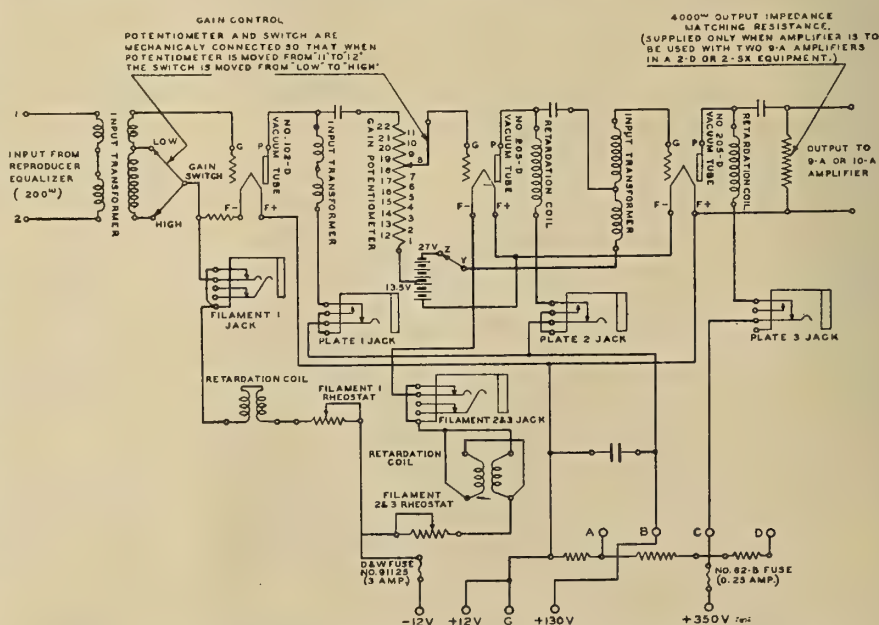
Our experience relates that the most pronounced deformation of any needle occurs during the initial period of service. It is quite true that very few producers are using disc recording—however, for those who are recording on disc, we must endeavor to make the reproduction as good as possible. Distortion, which usually occurs during disc recording can many times be traced to the pick-up. A good stiff needle is required for faithful reproduction—otherwise, movements at the armature end of the needle will not represent movements at the groove end on the record.

We desire to have the natural frequency of the system somewhat above the highest frequency to be reproduced. Many projectionists are using half-tone needles and many projectionists are still using the full-tone needles, and many have never given the subject much thought.

## W. E. 4-A Reproducer

A magnetic pick-up requires damping in order to smooth out resonant points, and at the same time maintain the proper neutral position of the armature. The Western Electric 4-A reproducers have these qualities. Half-tone needles play a very important part and may be considered as a mechanical filter in disc reproduction.

The Western Electric 4-A repro-



Schematic of 8-B amplifier, which gives a comprehensive understanding of how the various units are hooked together



ducer consists of a stylus connected to an armature of high permeability, which is located within a small coil. In operation the stylus attached to the armature vibrates as a needle follows the grooves on the record. The movement of the armature between the poles of the magnet which surrounds the armature causes a variation in magnetic lines of flux and a voltage with corresponding variations is induced in the coil.

If too much stiffness exists in the stylus, the relative motion of the armature and field will be reduced. The stylus should never be struck or twisted in an effort to remove a needle that is jammed. Do not allow dust and dirt to accumulate around the stylus.

#### Clean Records Essential

Free movement of the armature within the unit is necessary. Distortion will result, if this part cannot move freely; on the other hand, if the armature moves too freely a sputtering will result. I have found, on a few occasions, that complaints about sputtering and "frying" sounds

in disc recording were caused by a loose needle.

Always dust the record thoroughly before using. I have found that many projectionists have neglected to do this, with the result that the full amplitude of the recording was greatly reduced, because dust and dirt interferes greatly with the full motion of the stylus. Be positively sure that the tone arm is well balanced with uniform pressure, not too light and not too heavy. Uneven pressure of the tone arm will cause a flutter in disc recording.

Needles should only be used once and then discarded—in other words, they should be replaced at the same time when the record is changed. Worn needles will result in loss of high frequencies, because they cannot follow the high frequency grooves.

We are compelled to replace needles frequently in order that the needles point diameter may be small enough to follow the high-frequency modulations. There are many types of magnetic pick-ups, however, the same theory in operation applies to all.

## Hints on P.E. Cell Maintenance

By A. J. McMaster†

THE history of photoelectric cells in sound equipment is not greatly different from that of the equipment itself. In the early days of the reproduction of sound-from-film, the use of the photoelectric cell was probably the least understood part of the complete equipment, and was one of the principal sources of trouble, interruption of performance, and service calls. Today greatly improved photoelectric cells are available, and with properly designed equipment and reasonable care, the photoelectric cell may be considered to be one of the most dependable of the replacement parts of the modern sound-on-film projector.

Photoelectric cells, unlike many types of vacuum products, are inherently expensive to manufacture as compared to radio and amplifier tubes of the common variety. Moreover, the production volume of any type or size of cell cannot be compared with the quantities of vacuum tubes which are manufactured for radio, power amplifiers, etc., The manufacturing procedure—preparation and cleaning of parts, pumping, chemical treatment, and testing—of the modern photoelectric cell is carried out with extreme care with constant checking of the product at every stage.

Of all the component parts which make up the sound equipment, the photoelectric cell plays one of the most important roles in obtaining brilliant, clear-cut reproduction of voice and music, low background

noise, and ample volume without distortion.

It is, therefore, definite economy to install high quality photoelectric cells in every sound equipment. Furthermore, it is highly desirable to operate the cells under the proper conditions for maximum life and best reproduction. Although such information has not been generally available to the theatre exhibitor or his operators, the following suggestions will assist in properly understanding the operating conditions.

#### Safe Operating Voltages

High sensitivity of the photoelectric cell is desirable inasmuch as it makes possible the use of less amplification. Although the output of the cell increases as the cell voltage is raised, it is not desirable to raise

the voltage above a maximum safe value, which is considerably below the ionization point. At voltages above this safe maximum value, the life of the cell is materially reduced and inferior reproduction results. At voltages much above the safe value specified by the manufacturer, the volume actually decreases and the quality is very poor. It is, therefore, desirable to use cells of high sensitivity and to operate them at the lowest voltages possible.

Proper facilities for controlling the cell voltage should be available in every head amplifier. For those equipments which do not have cell voltage control, a simple attachment has been designed which can be readily installed by the average operator.

#### Means for Voltage Control

In Figure 1 is shown the wiring diagram of the cell connections to the usual head amplifier. This diagram also shows how the cell voltage control potentiometer can be installed with the minimum of changes in the circuit. By eliminating the necessity for rewiring or making soldered joints, the cell coupling resistor adaptor makes it possible to install the voltage control potentiometer in a few moments' time. Complete instructions for making this addition to the equipment are supplied by the manufacturer.

The advantages of cell voltage control are as follows:

- (1). It permits the use of the lowest cell voltage necessary to produce normal volume at normal fader setting, thereby improving tone quality and reducing background noise.
- (2). It provides a convenient means for absolutely matching the volume from each projector for the same fader setting.
- (3). With high sensitivity cells, the operating voltage is generally between 25 and 70 volts when new. As the cell slowly deteriorates, compensation for this change may be made by slightly increasing the cell voltage. Thus, instead of high output when the cell is new and gradu-

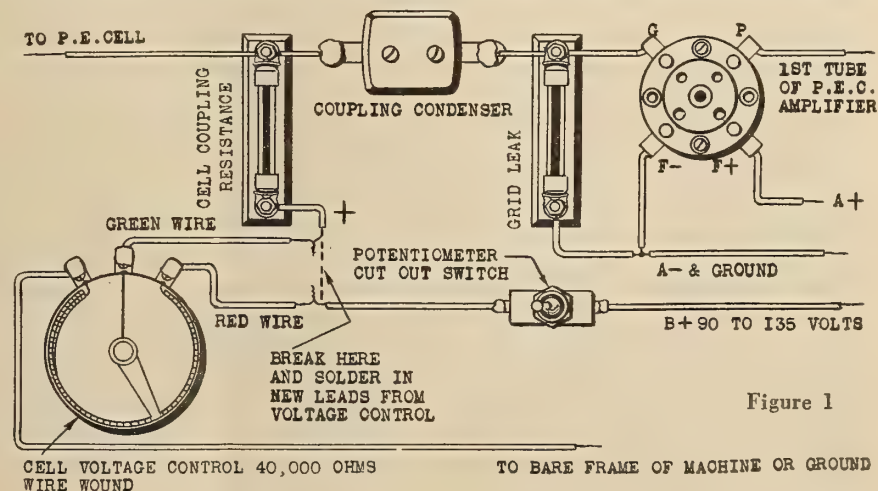


Figure 1

†G.-M. Laboratories, Inc.



ally decreased volume as it grows old, absolutely uniform performance during the entire life of the cell may be obtained.

(4). Greatly increased cell life and lower maintenance cost. The modern photoelectric cell operated under the conditions suggested above is unconditionally guaranteed for six months. As the result of extensive field tests and laboratory measurements, the life expectancy of the cell

is conservatively estimated at well over a year.

Economy in photoelectric cell maintenance need, therefore, be no longer a matter of chance. With the proper cell for the equipment, and the correct operating conditions, the modern high quality photoelectric cell represents low over-all cost, and freedom from service troubles and poor reproduction. A perfect show is possible only with the best equipment.

various projection booths and the installation angle that might produce best results in one case, would on the other hand prove disastrous when adopted by another. Therefore it is suggested that installation, be made, adopting that angle which is absolutely free of reflections, as that is the angle for best results. Furthermore the Fish-Schurman Corporation suggest that the portable glass be installed at the porthole end nearest the auditorium and the inside of the port be painted with a dull back paint so as to eliminate any possible reflections.—*Fish-Schurman Corp.*

## Questions and Answers

WITH this issue begins a regular monthly feature of MOTION PICTURE PROJECTIONIST—a Question and Answer department, a service for which there have been many requests from readers. In contrast to the usual conduct of such a department, no one person on the editorial staff will essay to answer all the questions submitted. Instead, all queries will be sorted and referred to a source of information which may be expected best to answer the question. For example: queries on screens will be referred to a screen company, those on sound picture apparatus to the manufacturer of the particular equipment referred to, questions on optics to an optical company, etc. Credit will be given to the agency responsible for the answer, and all answers will be carefully checked for accuracy. Although questions of a controversial nature are welcome, any comments which are considered to be out-and-out propaganda in favor of any particular apparatus or company will not be printed. This much having been said, we look forward to a long and useful life for this department—its usefulness depending, of course, upon the measure of cooperation extended by our readers.—*Editor.*

### Cleaning Screens

*Ques. What is the best method for cleaning a motion picture screen?—P. F. M., Volant, Penna.*

*Ans.* There is no satisfactory way of cleaning a screen despite many claims of manufacturers that screens can be washed. From the purely technical angle it is impossible to wash a screen. The fabric itself is washable and can be cleaned very easily, but it is almost humanly impossible to remove all of the dirt from so large an area as that of a motion picture screen, evenly and uniformly, without leaving streak.

The question of cleaning resolves itself down to the ability of an individual to remove the dirt uniformly from a large area. The particular cleanser used has very little bearing upon the subject as a screen can be washed with equal results with any reliable soap dissolved in warm water and the solution applied with a sponge and the screen rinsed off with clean water. Good results apply only to small areas, however.

Every major circuit has devoted a great deal of time to cleaning of screens. Up to date the most satisfactory means found is to brush off the screen with a fine goats hair brush at least once a week from the time it is installed. In this way the surface can be kept fairly free of dust. In case a vacuum cleaner is available, excellent results can be obtained by reversing the action of the cleaner and blowing the dust and dirt off the screen from an angle.—*Walker-American Corp.*

### Glass for Portholes

*Ques. At what angle from the vertical would you suggest tilting glass used in observation ports of projection rooms. Do you favor the use of glass in projector ports; and if so, where can a good glass be secured. We have been experimenting with glass in ports and find it necessary to tilt glass at about 45° angle from the vertical. Is this the usual angle?—F. F. Salamanca, N. Y.*

*Ans.* The advantages to be derived from the use of optical glass in projection room portholes have been proven many times. Since sound pictures have been adopted by the entire industry there is a decided increase in mechanical and other noises emitting from the modern projection room. Therefore it became imperative that a means of preventing this noise from reaching the auditorium be adopted. The Fish-Schurman Corporation, 45 West 45th Street, New York City, presented a glass that heretofore had been used only for the manufacture of precision instruments and other devices of a high technical nature. This glass known as F. S. C. Optical Crown Plates, is now being used for portholes throughout the entire industry with gratifying results. One of its foremost features being that as a plano parallel glass, it is adaptable for projection or photographic work, without fear of distortion.

When installation of the F. S. C. Portable glass is carried out, it cannot be specifically stated just what angle must be attained to produce the best results. This depends entirely upon the different arrangements of the

### Ionization in Tubes

*Ques. What occurs when a blue glow appears in a vacuum tube and why does it appear?—J. P. S., Chicago, Ill.*

*Ans.* The blue glow is due to the ionization of the gases remaining in the tube. By ionization is meant the breaking up of the gas atoms into electrons and positive ions, the tearing away of electrons from the atoms. It is due to collision of free electrons with slower gas atoms. The high voltage between the plate and the filament or cathode give the electrons a high velocity toward the plate. If they find no obstructions, such as an atom of gas, until they have traveled a considerable distance, the velocity is so great that when a collision does occur one or more electrons are knocked out of the atom and the light appears. The higher the voltage between the plate and the cathode, the shorter the necessary distance an electron has to travel before it has been accelerated enough to cause ionization on collision. For that reason the blue glow occurs most frequently when the voltage is high. A blue glow indicates a high plate current because every electron that is knocked free of an atom adds to the current.—*Samuel Wein.*

### What's On Your Mind?

## Why Not Organize?

CONDITIONS under which projectionists work in the British Isles—and, it may reasonably be supposed, elsewhere than in America—are set forth in detail in the following contribution made by David Robson, a leader among British projectionists, to the columns of *The Bioscope*, British trade journal:

Has the last attempt to organize the projectionists of this country failed? A quick review of recent events is only required to make one wonder. Whilst London supports the Guild of British Projectionists, other districts seek the strong protection of the Electrical Trades' Union, others the operators' branch of the N.A.T.E., and a greater number still, fraternities of their own.

Can any success, to speak nationally, come from such a divided front, whilst the major issues regarding wages and hours are much the same for us all? Here we are, holding the most important jobs on the exhibiting



side of the business today, with many of our members still drawing but fifty shillings (approx. \$12.00), for their week's labor and responsibilities. Whose fault is it? Certainly not the employers but the men themselves. This sum of money seems quite a satisfactory amount for some. I have a definite case of a London "union" man who took over a £6 (approx. \$30.00) a week job from another "union" man in Birmingham for the said fifty shillings, well knowing what he was doing. This is by no means an isolated case; it goes on somewhere every week.

#### They Manage Better in America

Disgraceful, you say. So do I. If that is the man's own estimate of his capabilities as an operator, his employer is not long in thinking the same, and away he goes. But the damage is done. A good man has been displaced and an exhibitor has learned that he was penny wise and pound foolish.

From this you can quite appreciate what a thankless, if not well-nigh impossible task it must be to organize such a scattered, indifferent body of workers. I make no apology for again awarding medals to our brother projectionists in America, whose wonderful organizations have made such happenings as I have quoted impos-

sible. The consequences of such a breach of discipline would be much more punishable than a week's notice from an employer over here; it would mean life expulsion from the industry.

Needed? Yes. Possible? Yes!

The men who earn the best wages and work under the best conditions in this country owe their success to their own independence. I mean by that, that they not only know the value of their own capabilities as projectionists, but so do their employers—thus mutual satisfaction. To promote *en masse* our fifty-shilling operators because they pay an annual subscription would be as unjust as it would be impossible. This type of man must have better ideals and fit himself first for the good job he seeks. The object of this article is certainly not to undermine the objects and endeavors of the respective organizations—far from it—but to create new interest and new ideas.

We want one and all under one banner, no differences, just a national, not sectional, organization with a new and powerful leader, not in any way tied to the renters' or exhibitors apron strings. Is it possible? Yes, and in this case certainly the more we are together the happier we'll be.

### Aleograph vs. ERPI

Federal Judge West has rendered a decision against the Aleograph Company in its suit for infringement against the Western Electric sound system. This action was brought last March in the U. S. District Court for the Western District of Texas, San Antonio Division. The Aleograph Company claimed infringement of a patent which was asserted to cover the standard theatre equipment of Electrical Research Products, Inc. The patent in question, No. 1,494,514, is entitled "Art of Producing Motion Pictures and Sound Synchronized Therewith," and relates to a mechanical connection between the turntable and film projecting apparatus and several other features of sound picture reproducing equipment.

After hearing the case Judge West gave a decision from the bench that the plaintiff had failed to establish any infringement. Judge West's opinion brings to a close the fifth suit relating to patent infringement which the Western Electric Co. and its affiliated interests have brought to a successful conclusion within the past year.

## Correct E. F. of Lens Combinations

By HARRY RUBIN

IT is commonly accepted by projectionists that the equivalent focus (e.f.), of two lenses when combined is equal to the sum of the individual focus of each lens, divided by four. This has been the standard basis for all computation procedure in the past. The above rule will admirably serve the purpose and enable one to obtain an accurate answer *only* when both lenses used in the particular combination are of the same focal length. However, when the focal lengths of the lens combination are *dissimilar* the above basis for computation will be misleading—ex-

ceedingly so, as will be shown.

For example, when a 10-inch lens is combined with a 40-inch lens, or vice versa, the e.f. for the combination, according to the commonly accepted standard cited above, would work out as follows:

$$\text{E. F.} = \frac{10+40}{4} = \frac{50}{4} = 12.5, \text{ Answer.}$$

The foregoing answer can be proven incorrect, for the reason that an image projected from such a combination should be larger than the image projected from either individual lens of that combination. In other words, the e.f. of that combination

should be shorter than the focus of either one of the combination. Referring again to the above equation, it is immediately apparent that the answer, 12.5, certainly is not a shorter focal length than that of one of the units—namely, the 10-inch lens.


The correct formula for computing the e.f. of any lens combination would be based on the following law: The e.f. of two lenses is equal to the reciprocal of the sum of reciprocals of the individual focus of each lens. Using the same sizes cited in the preceding equation, let us consider the following example:

$$\text{E. F.} = \frac{1}{1/10 + 1/40} = \frac{1}{5/40} = \frac{40}{5} = 8, \text{ Ans.}$$


	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
16	6.2	6.5	6.9	7.2	7.5	7.7	8.									
17	6.3	6.7	7.	7.4	7.7	8.	8.2	8.5								
18	6.4	6.8	7.2	7.5	7.9	8.2	8.5	8.7	9.							
19	6.6	7.	7.4	7.7	8.1	8.4	8.7	8.9	9.2	9.5						
20	6.7	7.1	7.5	7.9	8.2	8.6	8.9	9.2	9.5	9.8	10.					
21	6.8	7.2	7.6	8.	8.4	8.8	9.1	9.4	9.7	10.	10.2	10.5				
22	6.9	7.3	7.8	8.2	8.6	8.9	9.3	9.6	9.9	10.2	10.5	10.7	11.			
23	7.	7.4	7.9	8.3	8.7	9.1	9.4	9.8	10.1	10.4	10.7	11.	11.2	11.5		
24	7.1	7.5	8.	8.4	8.8	9.2	9.6	10.	10.3	10.6	10.9	11.2	11.5	11.7	12.	
25	7.1	7.6	8.1	8.6	9.	9.4	9.8	10.1	10.5	10.8	11.1	11.4	11.7	12.	12.2	12.5
26	7.2	7.7	8.2	8.7	9.1	9.5	9.9	10.3	10.6	11.	11.3	11.6	11.9	12.2	12.5	12.8
28	7.4	7.9	8.4	8.9	9.3	9.8	10.2	10.6	11.	11.3	11.7	12	12.3	12.6	12.9	13.2
30	7.5	8.	8.5	9.1	9.5	10.	10.4	10.9	11.3	11.6	12.	12.4	12.7	13.	13.3	13.6
32	7.6	8.2	8.7	9.2	9.7	10.2	10.7	11.1	11.5	11.9	12.3	12.7	13.	13.4	13.7	14.
34	7.7	8.3	8.9	9.4	9.9	10.4	10.9	11.3	11.8	12.2	12.6	13.	13.4	13.7	14.1	14.4
36	7.8	8.4	9.	9.6	10.1	10.6	11.1	11.5	12.	12.4	12.9	13.3	13.7	14.	14.4	14.8
38	7.9	8.5	9.1	9.7	10.2	10.8	11.3	11.7	12.2	12.7	13.1	13.5	13.9	14.3	14.7	15.1
40	8.	8.6	9.2	9.8	10.4	10.9	11.4	11.9	12.4	12.9	13.3	13.8	14.2	14.6	15.	15.4

This table is designed to give at a glance the correct equivalent focus of two lenses used in combination. The above figures are correct within one-tenth of an inch for all practical purposes.





# in the Laboratory



Conducted by SAMUEL WEIN

## Mechanical Reproduction of Sound Film

**P**UBLICATION in a recent issue of the International Review of Educational Cinematography of a "new" method of reproducing sound-on-film once again invites attention to the various contributions to the art of mechanical reproduction of sound-on film. Many and varied have been the efforts to obviate the necessity for using optical means for this purpose, but although one method offers a possible solution, none of these processes may be said to have provided the answer to this problem. The contribution mentioned above is the work of Gastone Frediani,<sup>1</sup> Italian inventor, and is presented here in abstract form:

The object of this apparatus is to dispense with the use of photo-electric elements in the reproduction of sound photographed on film, by photographing the sound either directly on the edge of the film or on separate film, which is then turned in perfect synchronization with the picture film. The reproduction of the photographed sounds is obtained by substituting for the photo-electric elements in the amplifier a device consisting of two electric contacts in the form of metal drums placed at a certain distance from each other and electrically insulated. They rest upon the *layer of developed sound images* which connects them electrically with the grid circuit of the first audion (low-frequency amplifier).

The photographic layer of sound images, *as the sound film passes over it*, acts on the grid circuit as a conductor of variable resistance. In point of fact, the layer constituting the photographed images of sounds is made of very fine particles of silver and possesses more or less electrical conductivity according to the degree of darkness or intensity of the sound images—that is, according to the quantity of silver salts reduced by the light during the process of photographing the sound. Accordingly the *passage* of the film with its developed layer beneath the two aforementioned metal drums, connecting them like an electric bridge in the grid circuit of the first audion, produces variations of electric potential in the grid of this audion in proportion to the electrical conductivity of the photographed sound images, and these variations of potential in the grid will result in corresponding variations in the electron current, which when amplified by the other tubes will be transmitted to the loudspeaker.

This system of reproducing sound photographed on film—which can be specially adapted to sound cinematography—eliminates the photo-electric elements with their optical illuminating device, and therefore, since the film no longer need be transparent, it can be made of paper, oil-cloth, etc., instead of celluloid; these paper copies of the original transparent sound negative can be sensitized not only by silver salts *but also* by bichromate gelatine with the addition of colloidal metallic solutions or electrically conductive powders. These films, too, will be electrically modulated, according to the same law of modulations which governs the transparent sound negative. Corresponding, in fact, to the more transparent parts of the sound negative, a greater quantity of light will pass through and, when printing the copy on gelatine paper, after development, a greater quantity of electrically conductive powder will adhere to the film, which therefore at these points will possess maximum conductivity (as is the case with sound-film copies on paper sensitized with silver salts).

If the very fine powders added to the bichromate gelatine consist of magnetic elements such as iron, cobalt or nickel, the result will be a sound-film on paper which is not only electrically but also *magnetically* modulated.

After being developed, it will, according to the transparencies in the original negative, offer the maximum thickness of magnetic powder and therefore the minimum magnetic resistance. If this sound-film—of bichromate gelatine and magnetically modulated—is then passed between the poles of a permanent magnet having at its poles two coils which by means of two other coils act upon the grid circuit of the first audion in the amplifier, these coils will set up electro-motor tension which will alter the potential of the grid in the first electron tubes and reproduce the sounds in the loudspeaker in the usual way.

### Process Dates Back to 1886

There are approximately 25 patents relating specifically to this purpose. The idea is decidedly not new, the first patent relating to a similar purpose having been granted to L. Bock.<sup>2</sup> Bock photographed the sound using an "optical slit" on a "photographic slit." Contacts were applied to the emulsion on the "strip" and then fed into the primary of a transformer, the secondary of which was connected to a telephone receiver. "Film" was not commercially used at the time of Bock's disclosure (1886); but while Bock did not specify any *particular* medium he did claim a "transparent film or any other medium." It was of course, much too early in the art to use an "amplifier" and so he had to use a "head phone." Bock's patent refers to the use of a "special emulsion," but it is obvious that silver emulsions are applicable for the same purpose.

More recently, Roy J. Pomeroy of the Paramount Famous Lasky technical staff was granted a patent<sup>3</sup> which is of such scope as to include practically every advance made in this particular field of endeavor. Indeed, Pomeroy's patent is the only one of all those granted for this purpose which gives promise of being equally valuable in practical application as it appears to be in theory. Frediani's method employs a resistance change; while Pomeroy utilizes a capacity change. The Pomeroy patent is extremely complete as to detail and presents a complete circuit and hook-up.

A few salient facts pertinent to this process are appended hereto and are worthy of consideration:

1. Old film will give rise to so-called surface noise, as do old phonograph records.
2. It is common practice to coat all film with a certain compound to "harden" its surface (emulsion side), to prevent too easy scratching. This coating would naturally increase the resistance of the emulsion and therefore make it rather difficult to reproduce the sound.
3. A new kind of "sound patch" would have to be devised to meet the requirements of this process.
4. It appears to this writer that it is possible to secure a greater initial "kick" in the first tube of an amplifier by this means than is the case with light sensitive cells. In addition, no pre-amplifier, other than a "C" battery and transformer, will be needed. The output of the latter would be fed into the conventional amplifier.

### REFERENCES:

<sup>1</sup>This invention was patented in Italy under No. 275,669 on Feb. 14th, 1930; but a description thereof was deposited with certain Royal Academies of Science in Nov., 1929.

<sup>2</sup>U. S. Patent No. 364,472, June 7, 1887.

<sup>3</sup>U. S. Patent No. 1,715,863, June 4, 1929.



# Analyzing Auditorium "Dead Spots"

By R. F. Norris†

IT does not seem that in this day and age there is any great need of discussing the necessity for proper hearing conditions in theatres. Theatres are being built larger and more ornate to accommodate, with the utmost luxury, a large number of auditors. It has been pointed out that this tendency towards larger auditoriums introduces a great number of acoustical difficulties. These, of course, may be remedied by the proper application of acoustical engineering, and the necessity of having a proper period of reverberation has been stressed very hard by people who are interested in the theoretical considerations, and also by those who are interested in the actual supplying of materials for the correction of such rooms.

Several articles have appeared showing how one may determine rather simply whether his theatre does or does not have a period of reverberation which is low enough to be commensurate with proper audition conditions. However, it has been found that in many theatres with periods of reverberation which are satisfactorily low, there are areas in which it is almost impossible to hear what is going on on the stage. These spots have been termed "dead spots" for lack of a better name.

## "Dead Spot" Detection Difficult

In a rather reverberant room dead spots may occur, but unfortunately they are not easily detected. If the room is acoustically treated to make the period of reverberation low, these dead spots stand forth with the conspicuousness of a bandaged thumb. The reason for this is that these dead spots are caused by echoes from surfaces which are so placed that sound can come from the performer to the surfaces and be reflected back to the auditor as well as and almost as easily as it can come from the performer to the auditor direct.

† Burgess Laboratories.

Unfortunately, the path to the echoing surface and thence to the auditor is usually considerably longer than the direct path. Since sound travels at a uniform rate of speed, the same sound arrives at the auditor at two different times, one slightly after the other. This causes a confusion as far as the auditor is concerned which is comparable to that caused by two people speaking at the same time. Only by greatly exerting his attention can he distinguish what is being said by either.

In a theatre which is properly deadened there is no difficulty in finding these dead spots, but it is quite another matter to determine the reflecting surfaces which cause them. There have been several rather ingenious ways worked out to determine which surfaces are to blame, but in the main these methods are rather cumbersome to use and require a considerable amount of rather expensive scientific equipment.

The Burgess photo-echo method of analyzing theatres was designed solely to detect these echo-producing surfaces and to find them in a manner which is easy and inexpensive. Only accurate scale drawings of the different sections of the auditorium and a few simple accessories are required in the use of the Burgess method. The significant sections in an auditorium usually are the horizontal cross-section showing the floor plan; the longitudinal cross-section showing the ceiling, floor, and balcony elevations; and two or three transverse sections showing the curvature of the ceiling from one side of the auditorium to the other.

## Procedure by Burgess Method

To study the sections and to find out just how the sound will be reflected by the different sections it is only necessary that they be laid out on sheets of fairly stiff white paper to a scale which will make the length

of the auditorium approximately 1½ feet.

Several pieces of bright sheet metal ½ in. wide are cut. These strips may

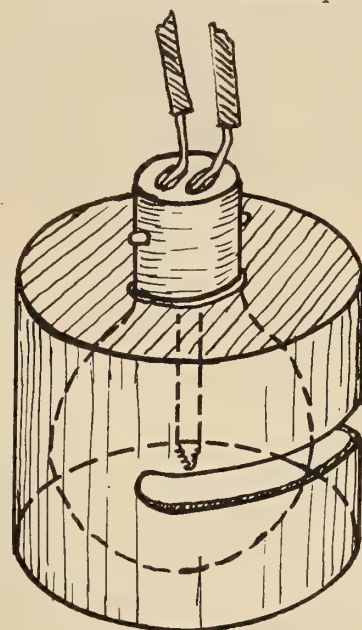


Figure 2

be cut of tin plate or preferably of nickel plated brass sheet. Any metal having a white mirror-like surface will do. The strips of metal are then bent to conform to the contours of the auditorium as closely as possible. With a little experimenting and practice the lines may be followed with great fidelity. The metal is then set on these lines in such a way that its width, the ½ in. dimension, is perpendicular to the plane of the paper. When the metal has all been bent and set up the auditorium will be fenced in with a little bright metal fence ½ in. high which will completely surround it. This fence may be omitted over the portion of the outline which represents the stage opening. (Fig. 1.)

Next, an automobile headlight bulb should be connected to a six-volt battery so that it may be lighted. This bulb should be sealed with a cardboard or metal shield so that the light will be emitted through a slit which will produce a band of illumination approximately parallel to the surface of the paper. (Fig. 2.) Now, if this shielded lamp is placed in the position of the speaker on the stage, light will be sent out and will strike against the reflecting metal walls of the enclosure which in turn will reflect it back into the interior of the figure. This will cause areas of high illumination on the paper where the reflected light is concentrated. (Fig. 3.)

If this be done in a darkened room, it will be very easy to see exactly

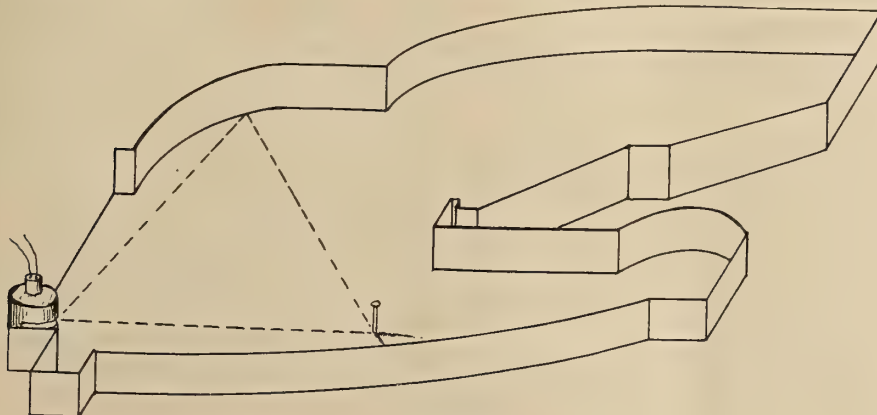


Figure 1





Figure 3

where the reflections will fall. We may assume that in a full size auditorium sound will reflect exactly as light reflects in the small model with the exception that the sound will be diffused to a greater degree than is the light. This discrepancy is of little importance since the surfaces which are causing bad reflections are to be determined rather than the areas over which this disturbance can be heard. An area of disturbance indicated in the model will be slightly less than that actually obtained in the theatre. However, the indicated center of disturbance will coincide with the actual center of disturbance.

To determine more definitely from which surfaces the reflected sound or light is proceeding it is very helpful to insert pins upright in the paper in the positions which would be occupied by auditors. Each one of these pins will cast a shadow which will point directly away from the source of light or from the speaker on the stage. That shadow is caused by the direct light coming from the source. The pin may also cast another or several other shadows which will all point in different directions. Each

of these shadows will then be pointed away from some reflecting surface which is causing a disturbance. If the direction of the shadow is prolonged through the pin, the resulting line will touch the surface which is producing the disturbance. (See dotted line in Fig. 1.)

#### Reading the Results

The surfaces which are indicated by these shadows should then be treated with a very highly sound-absorbent material. It is evident that since the dead spots are caused by reflections from these surfaces the more efficient the acoustic material covering these surfaces can be, the more thoroughly the dead spots will be eradicated. Consequently the very best or most highly absorbent acoustic material should be used for the treatment of these spots. A material having not less than 70 per cent. sound absorption over the range of from 512 to 1,024 vibrations per second should be used.

Figure 3 is an actual photograph of a set-up; and shows an auditorium in which "dead spots" occurred in the section of the house just in front of the balcony.

reviewer's disagreement with this nomenclature are well known to readers of this publication.

With the exception of one chapter dealing with photo-conduction and photo-voltaic types of cells, this book is devoted exclusively to the phototube. In fact, it is an ideal elementary treatise on the phototube and as a source of information on that specific form of cell is recommended highly. All the data presented on this form of cell is accurate, very well presented, and is buttressed by profuse and interesting reference matter.

#### Other Types Ignored

However, this reviewer cannot ignore the implications contained in the single chapter which treats of the photo-conduction and photo-voltaic types. In addition to being decidedly vague, this particular chapter leaves with the reader an impression that both these forms of cells have no contemporary significance and should be classified as "has beens." We disagree emphatically with this contention. As a matter of fact, selenium cells (photo-conduction type) are now being applied commercially for theatre work in sound pictures. The photo-voltaic cell, too, is offering stern competition to the phototube, the former requiring no pre-amplifier and practically eliminating background noise. These two types of cells cannot be dismissed or shoved aside by a mere statement that they are useless; performance is what counts.

The photo-conduction and photo-voltaic cells are, for some purposes (other than television), very much better than the phototube. As a matter of fact, some of the oxides of metals, which are classified under photo-conduction properties, are sufficiently fast in response to function in television transmitters, which indicates their worth.

#### Good Elementary

With the exception of this data on forms of cells other than the phototube, we are entirely in agreement with the subject matter of this book and consider it a splendid elementary guide on the phototube.—Samuel Wein.



## Book Review



**PHOTOCELLS and Their Applications**—By V. K. Zworykin and E. D. Wilson. 209 pages, 98 illustrations, and 114 references to the literature which are found at the end of each chapter. Published by John Wiley & Sons, New York City. Price, \$2.50.

Both authors are research engineers in the Westinghouse Research Laboratories and are eminently qualified to prepare a work of this nature. Dr. Zworykin is very well known to workers in the field of light sensitive cells because of his many valuable contributions to this highly specialized art.

In the preface the authors use the

terms "photocell" and "phototube" to designate the device more commonly known as the "photo-electric" cell, as distinguished from the "photo-conduction" and "photo-voltaic" types of cells. This subject of correct nomenclature for light sensitive cells has been discussed many times in these columns, thus it is unnecessary to go further into the matter at this time. Suffice it to say that the Institute of Radio Engineers has adopted the terms "phototube" as expressive of any type of light sensitive cell which comes under the classification of the "Hallwach effect," i.e., photo-electronic emission. The reasons for this

#### W. E. Service System Far-Flung

To service the 4,789 installations of the Western Electric sound system in the United States, Electrical Research Products now has over 450 service engineers who make their headquarters in 220 towns and cities throughout the country.

New York with 34 resident engineers leads all other cities; Chicago is second with 26; Los Angeles, third, with 18 and Philadelphia is fourth with 16. Boston has 15, Kansas City 10. In servicing Western Electric equipped theatres these 450 service men travel a total of 93,000 miles every week, or an average of 205 miles for every service man each week.



# More Opinions on New Release Print

WITH practically 100 per cent coverage of this country and Canada having been effected in the distribution of the new Standard Release Print, the plan may now be given a fair test under actual operating conditions in all types of theatres. Wider distribution of the new prints will also enable the agencies sponsoring the plan to secure, through the cooperation of projectionists, an accurate idea as to its practicability. Reports secured from throughout the country indicate that there is not a little opposition to this new standard, but there are many groups who favor the plan. Apparently it is a case of either being strongly against or for the new standard.

The general opinion among projectionists seems to be that, while the new print leaves something to be desired through its utilization of a visual signal, it is far and away the best system for insuring a uniform changeover that has been devised to date. It is significant that none of those who object to the plan has anything in the way of a substitute to suggest.

While projectionists are discussing the merits of the plan pro and con, the work of establishing a nation-wide organization of projectionists and producer representatives to put the plan into actual operation is progressing rapidly. Already more than twenty-five projectionists in various parts of the country have been appointed to co-operate with their local film boards of trade on the plan. Within a few days a complete roster of projectionists representatives will be available, after which time the actual work of furthering the plan will be undertaken on a vigorous basis.

Opinions on the plan continue to come in from all sections of this country and Canada, and a few of the representative comments are appended hereto.

## —Reading, Pa.—

Sir:—Received the copy of the Standard Release Print and have brought same to the attention of our Local. The organization feels that this is a step in the right direction.

As a matter of suggestion, I believe it would be considerably better to place the marks nearer to the corner of the picture so they would be less noticeable to the audience. Also I think they could be made smaller for the same reason. The footage marks at the beginning of the reels are excellent and fill a long-felt need.

There is considerable education needed among the projectionists, as to the handling of this film. I am employed in a first-run Paramount House, and we are this week running "Tom Sawyer." The ends of parts one, three, five, and seven, as well as the beginning of parts two, four, six, and eight, show a loss of approximately four inches each, which of course has been caused by the film being doubled. The aforementioned fault of course prevents the use of the marks, or compels us to double. At the rate of this loss till the last fellow

gets it, the marks will be entirely eliminated. The correction of this evil of course lies with the film exchanges, and they should take drastic measures to eliminate it.

I would be pleased to do anything within my power, in this section, to assist the Officers of the Council in their work.—H. Merrill Young, *Bus. Rep.*, L. U. 661.

## —Rochester, N. Y.—

Sir:—Your remarks in regard to "Craft Morale" in the December issue of our one and only periodical arouses me to comment and may I do it without becoming too bitter. You, in an editorial chair, seem to fear a little the "torrent of argument" let loose on anyone who mentions "this deficiency in craft morale"; so you should readily understand my unwillingness to go very far in what I have to say.

The new standard release print seems to be a step in the right direction, BUT it isn't going to mean very much unless something is done to keep it a "standard" print, and that means putting a stop to the despicable practices indulged in by so many men who are in charge of projection rooms. We have had very little experience with the new standard print, or what might be called its forerunner. What experience we have had shows us that no more respect is going to be shown this print by a certain class of men than has been shown to any other print that gets into their hands. The first-run houses, manned by projectionists who are capable and ambitious to put on a good show, and who send out the print in good condition, should be better able to judge the worthwhile features and any improvements that might be made.

Prints are coming into our theater in terrible shape, and not only is there no indication that there will be an improvement, there is even indication at this early date that this new standard print is going to receive the same treatment at the prior

runs that every other print has received. The prints are cut up, joined up, and muddled up in every conceivable way. Dialogue is missing; action is missing; continuity is lost and mixed up. Black run-down leaders are missing and out-of-frame. Patches are made with poor cement, insufficient cement, and even without scraping the emulsion. Reel part numbers are missing and mixed up. And then at the end of the reel we find the most rotten mess of all—click splices, scratches, punch marks, stickers and every imaginable thing is used to arouse the dormant mind of some misplaced individual to the fact that he should make a changeover. These marks must arouse even the most sluggish mind and body, as they look like lightning on the screen and many cases cause a sound like thunder in the loud-speakers. As was to be expected from some of these men, I have seen cases where a scratch was apparently made in the sound track deliberately as a changeover warning mark.

## Cooperation Essential

There is one big reason for the lack of comment. Many of us projectionists in the subsequent-run houses have seen so much of this sort of thing that we are discouraged that anything will ever be done to relieve the situation. Regardless of whether an exchange sends out a standard print or not, they do send out new prints, and these prints are worn out long before their time in improperly manned and equipped projection rooms. Some damage occurs in shipping (and the exchanges are to blame to a great extent for any improper shipping), but the greatest part, if not all, film damage occurs in projection rooms, and no change in standards will help the least bit unless these misplaced individuals are made either to get out of the industry or get in line with it.

From what I have read and learned concerning this new standard release print, it seems to indicate a step forward. It

## Art Schroeder Says "No"

MAY I say just a few words in regard to the "new" idea the studios are now using — the black spots on the ends of the reels for the change-overs?

It seems to me that this is a step backwards. After all the years that exchanges and producers have been yelling about the old punch marks, a new twist is given to the idea and put back into circulation again. The only good (?) thing about it is that it has been made standard. The system has no merit; it is not even as efficient as the old punch mark. No one will deny the fact that it is much easier to see the flash of light due to a punch mark than it is to see the dark spots, even on a light scene. When they show up on a white scene it seems as though they look as bad as the punch mark. On a dark scene? Yes, you can see them if you look hard enough. Just one more thing to make the projectionist strain his eyes harder.

They have graciously given us four little spots to look for. At ninety feet per minute these four spots appear on the screen for the long space of time—one-sixth of a second. Hardly longer than the blinking of an eye. And unless you are looking right where they are going to pop up,

you don't see them. You cannot glance at the left margin of the picture, or the lower edge of the picture; you will miss them, unless the scene is quite light.

Then what happens after the reels have been doubled up and cut down again a half-dozen times? Or when the sprocket holes become so bad that a few feet have to be cut out? The sprockets holes here have nearly as tough a break as do those at the start of the reel. We have just received a double-up print right from the producer, to be run in one of the finest houses in Los Angeles. Not only is the presentation of this picture spoiled by these marks at the ends of the doubled-up reels, but also in the middle of the reels, where they have been cemented together, and where they do no good even as a changeover cue.

I believe that eventually a way will be found to do this thing in a much better way. Possibly it cannot be made part of the film. The industry has the brains to do it if they will, but if this black spot idea is accepted and put into universal use there will be no incentive to work on any other idea and we will have the spots with us from now on.—A. C. SCHROEDER.



should not be necessary to have a visual signal on the screen as a changeover mark, except in some very rare cases; but if we must have it, let's have it as small as possible (probably at least one-half the size of the signal now used), and for a minimum of time, not more than four frames. Possibly three would be enough. And now lest there be suspicion that the writer pretends to a bit of infallibility in projection matters, let me say that the leaders should be absolutely blank, because even visual changeover signals are missed occasionally and in such cases even a blank screen is bad enough.

You are doing great work! Keep it up! Get a stronger editorial chair, brace yourself for a "torrent of argument" and go to it! If there is anything the matter with show business, the biggest fault is poor projection and it's up to the projectionists to remedy that; nothing will be done to remedy it unless there is a big improvement in "Craft Morale." Maybe making some men "mad" will improve their morale or whatever it is that would make them better fitted to be in charge of the most important educational and entertaining force in the country outside the libraries.

—Frederic J. Closser.

#### —San Francisco, Cal.—

Sir:—It is very evident that the cooperation of all hands in this matter has brought forth a very excellent change in the Make-up of Release Prints.

Several years ago—in conjunction with the exhibitors and the film exchanges of this city—we put into operation a similar plan, of course, on a smaller scale, which was quite a success and which had been maintained pretty well since that time. But with the coming of sound pictures so much more has been demanded that we feel the work done here is going to be a wonderful aid, and desire to compliment the Council on its share and to hope that this will be the success it deserves to be. All of our men are enthusiastic who have been in receipt of information fully describing the new make-up.—W. G. Woods, Secty. L. U. 162.

#### —Los Angeles, Cal.—

Sir:—Why not get out the old punch with its stars, crescents, hearts, etc.? Or perhaps get a grease pencil and mark squares, crosses, or circles. A standard changeover system has been sought for a long time. Well, if the dot system is adopted, it will be a standard and that is all it will be.

Do you, Mr. Editor, honestly believe it is a good system; aside from the fact that it is a long-sought-for standard? I don't and here are a few reasons:

1. It is a slipshod work saver; 2. It is a copy of the old outlawed punch mark only now it is in mourning. (How many "operators" have you cursed for punching film?) 3. It is noticed by the patron and momentarily distracts their thoughts from the play. Curiosity is aroused as to what they are. Illusion is the basic principle of the motion pictures and any foreign element in the scene is quickly noticed. 4. It absolutely spoils the beauty of any panorama, such as is in "Billy the Kid" or in "The Big Trail."—Ray Brown.

#### —Sunbury, Pa.—

Sir:—We have had several Standard Prints and the cues work out very well, the only thing is that we have had some prints on which the dots were misplaced. On "Remote Control"—M. G. M., the start cue was only five feet from the end. On "The Lady Surrenders"—Universal, the numbered frames were O.K., but there was a six-foot blank between the three-foot mark and the start of the picture. Also I think on the fade-outs the changeover dots should be at the end of the fade-out instead of one foot from the end, as in this way if you change over on the dots you miss part of the fade-out; and if you wait for the fade-out you miss part of the fade-in, on

the incoming reel. The only way we can get both the fade-in and the fade-out is to let a foot more of blank to be run down when we thread up a reel which fades-in.

We are very grateful to you for what you have accomplished and you may be assured of the fullest cooperation from myself and the boys here.—R. H. Search, Secty. L. U. 403.

#### —Edmonton, Canada—

Sir:—So far we have had one Standard Print and after following the instructions in your book found that if we thread up on the frame marked 7 we can make a perfect changeover, using the dots for start motor and changeover. We wish to thank you for your splendid work in having this standard adopted, as it will undoubtedly do much to eliminate much damage to prints as well as make for a smoother show; it will also help along to our ultimate aim of perfect projection.

After we have had further experience with the Standard Prints, we may be in a position to make further comments on same, and should we have any suggestions to offer for improvement we will write you again.—F. P. Broadbent, Secty. L. U. 360.

#### —New Brunswick, N. J.—

Sir:—Lately I have had the pleasure of using quite a few of the "Standard Release Prints" which I like very much and think they are a god send to the projectionist, except for one thing: Personally, I think they are just a little bit too shot. The Prints I have had were all from Columbia Pictures Corp. I have Western Electric slow pick-up motors and find difficulty in getting up to speed. It seems that the M. G. M. Prints which have used these dots longer have a much better system. They at least allow you 3 feet after changeover dot in case motor is not up to speed.

I think that if the cues were spaced 12 feet from dot-to-dot and a 3-foot emerging film, it would be better. On my machines I have to frame on No. 4, and then the incoming machine just clears the blank. Yesterday I had one of these, and when I changed over, the person spoke immediately and it didn't sound so good.—Richard Fitz.

### Inspection Routine

Minor replacements and adjustments which the service engineer may find necessary to accomplish during the period of a routine inspection, including the hour before the show.

- Replacing lens assembly
- Replacing P.E.C. batteries
- Replacing grid batteries
- Replacing motor coupling
- Replacing take-up discs
- Replacing 4-A reproducer
- Replacing exciting lamp rheostat
- Replacing milliammeter (where it is unnecessary to disassemble apparatus)
- Replacing Photo-electric Cells
- Replacing 703-A, 705-A and 706-A shafts
- Replacing tension pad assembly (1-A sound unit)
- Replacing fader contact springs or cleaning guide rollers
- Replacing pad rollers
- Replacing motor control cabinet
- Replacing vacuum tubes (only in period before show or during intermissions)
- Adjusting attenuators or equalizers
- Adjusting 708-A drive
- Adjusting guide roller

#### —Oklahoma City, Okla.—

Sir:—This will acknowledge receipt of your letter under date of October 31st, together with copy of the "Standard Release Print Make-up and Practice," which I think is a good idea, and most of our members seem to think likewise. We have been using this system on all the new prints we receive that bear these marks and find them to work out very good. At the same time it saves the projectionist considerable work in making up his program as well as eliminates patches and marks noticeable on the screen as some still use.

—Berlin Parks, Secty. L. U. 380.

#### —Niagara Falls, N. Y.—

Sir:—As comments on the standard release print seem to be in order, we would like to express our opinion on the subject.

In the first place, I doubt if there are two projection rooms in the country that are using the same ratio for changeovers. By ratio I mean the footage required to be at speed for the changeover. The equipment we are working with will be up to speed in five feet, while other equipments have to have more footage to get up to speed.

We had a print with the standard marks in it and found it to be all right for us, as the footage from mark to mark was eleven feet, allowing us more footage than we needed. As long as the leader is twelve feet long we cannot, after considerable experience with various equipments, see why there should be any objection to this system for a universal changeover.

#### Plan in General Good

In fact, most of the comments we have read seem to be concerned with details such as the size of the spot. We do believe the spots might be made a little smaller, but it would be taking a change to use fewer of them. Altogether, though, we are very much in favor of the standard release print. It will surely be a great relief to know that all our changeovers will be alike, and to get away from the assorted mutilations that have passed for changeover cues in the past.

So best wishes to the council, and be assured of the support and cooperation of two more projectionists.—Fred Moag, President L. U. 121; and G. H. Robinson.

#### —St. Petersburg, Fla.—

Sir:—I have received and studied carefully the claims made for the Standard Release Print. Have also seen several of the prints and found them far from satisfactory. Only three benefits have come with the Standard Release Print, and they are: First, a part title that is legible and can easily be seen in any position, although the numeral would be better if  $\frac{1}{2}$  frame height. Second, keeping significant sound five feet from ends of all reels. Third, the recommendation that fade-outs be used for changeovers whenever possible.

The footage marks for threading are perhaps acceptable. Certainly they are of no help to those who have no rehearsals and have changeover devices between the light and film. If the end title on a subject finishing is shorter than anticipated, and the changeover is made a little prematurely, the sight of the "3" footage mark flashing on the screen is not a valuable addition to the entertainment. To protect against such occurrences it seems to be the practice to turn down past the footage numbers and thus the full benefit of the fade-out and fade-in changeover is lost as the fade-in and part of the first scene or title has already passed when the changeover is made.

It also seems more convenient to thread on the "Start" mark and then turn down the required footage. This eliminates having so much film on the floor, having so much to wind on the take-up reel by hand, and serves as a positive check of threading by running down a few feet. It would be better if these transparent frames marked with footages were eliminated from short subjects and first reels of features, as



changeovers between subjects can hardly be standardized on account of cutting in trailers, etc.

Ever since producers have been using negative punch marks for cues I have been cutting them out (except S.M. cues on disc prints) and using the resulting splices for cues. Other projectionists I know are doing likewise.

#### Why Are Punch Marks in Negative Any Better Than Punch Marks in Positive?

Here we have been fighting to keep punch marks, scratches and other visible cues from the prints, and now the Exchanges send out NEW PRINTS WITH PUNCH MARKS PRINTED IN! A punch mark is a punch mark! It makes no difference whether it is white on a black background or black on a white background, it is a punch mark and has no business on the screen in any theatre. It is indeed discouraging, as before this we could at least depend on a new print being free from disfiguring marks. Any interruption or distraction in a picture not directly connected with the story that was filmed serves only to destroy the illusion and brings back to the audience the fact that it is only a mechanical device and not a very smooth-working one at that.

The punch marks (if they must be used), are too large, there are too many, and they are in the wrong part of the picture. A black mark in the upper part of the picture is very conspicuous as, in the majority of cases, the background at this point is light, such as sky, etc. If such marks must be used why not put them at the bottom instead of at the top of the frame?

Also, by all means eliminate the change-over marks on fade-outs. There is not the remotest resemblance to a reason for having a mark there. It only distracts the audience and aggravates the projectionist.

It seems to me that the S. R. P. was made to cater to the "Tank Town" class of machine operators who grab their show out of the can, run it without inspection (using the bent exchange reels in the magazines), and send it out perhaps the same night. Why should careful painstaking projectionists be shouldered with such a crude change-over system? The effect of these conspicuous marks on the screen greatly lessens one's desire to do good work.

#### Cue Sheets Preferable

One answer to the problem is to have the producers send cue sheets that are clear, brief and CORRECT, and to keep significant sound at least five feet from the ends of all reels. If this is done and projectionists learn that the cue sheets can be depended on, I believe an improvement in projection would be noticed.

While we are discussing the S. R. P.'s, let us not neglect the Combination Print which is more of a nuisance at present. Prints intended for sound-on-film reproduction are received from the Exchanges with black-outs inserted having the frame-line extending across the sound track area. Imagine the projectionist in a better-class second-run theatre. When he receives a Standard Release Combination Print he follows the Manager's instructions and cuts out all black-outs. He naturally removes all scratch marks, punch marks, china pencil marks, and gummed paper markers put in by those who ran it before him and did not see fit to strain their eyes looking for the S. R. P. marks. And then for the good of the industry, his theatre, and his pride in his work, he removes the S. R. P. marks and makes himself a brief cue sheet using whatever splices, sound or action (if there is any left), that is most easily detected.

The results? Far from good. So many cuts ruin the continuity of both picture and sound (they were ruined before by punches and scratches in both picture and sound track area), but Mr. Projectionist has the satisfaction of knowing that he is putting on the best possible show with what is available to him; and he has hopes that if he cuts enough the Exchange will send him better prints in the future. They do!

It is encouraging to see some effort made to standardize release prints, but the

### Harry Rubin Heads S. M. P. E. Projection Committee

Harry Rubin, Supervisor of Projection for Publix Theaters, has just been named Chairman of the S.M.P.E.



H. Rubin

Projection Committee for the coming year. Rubin has to his credit many improvements in projection technique, and his presentation effect work in Publix theaters is an outstanding feature of the Publix programs. He has been a licensed projectionist since 1907, and directed the first continuous de luxe motion picture presentations given on Broadway.

Rubin is a member of L.U. 306 of the I.A., the American Projection Society, the S.M.P.E., and is treasurer and a director of the Projection Advisory Council. He has just returned from Europe where he inspected projection facilities in Publix houses on the Continent and in England.

greatest help will be the elimination of combination prints and the furnishing of dependable cue sheets.—Francis L. Hill.

#### Troy, N. Y.

Sir:—In answer to your request for comments and a complaint of lack of comments on the new standard release print, I think you will receive plenty and in the most part adverse.

It is indeed a sad commentary upon the abilities and intelligence of the projectionists throughout the United States and Canada and they must be given first a kick in the shins and next a slap right in the face in order to make a perfect change-over. The markings are no less conspicuous than the crayon markings and sticker strips which are placed as cues by "honky-tonk" operators. We may as well go back to the old days of showing the end of each reel.

Any projectionist who is interested in his work and has applied himself to his task has heretofore been able to accomplish perfect or as near perfect changeovers as human capabilities permit. Previously when we received a print with crayon markings, punch holes or stickers we made haste to remove them so as not to show them on the screen; and our first impulse is to cut out these black dots in much the same manner. These markings will not eliminate the practices which are indulged in by operators in outlying small towns of putting their favorite punch hole or scratch mark on the films, so why subject the first run theatres in the average cities to the nuisance of viewing these marks?

I do hope that projectionists will feel that their craft is being maligned and belittled by the inference which these marks convey.—C. H. McCarthy.

#### Salt Lake City, Utah

Sir:—I would like to direct your attention to the fact that Radio Pictures are not using the standard print make-up in its entirety and are omitting the standard visible signals at the end of the reel both for S.M. and C.O. Also, all prints of the

other producing companies are using the round black dot regardless of whether the background is light or dark. Will it be possible to have these variances from the standard corrected? I will do everything I possibly can to cooperate with the Council on this matter.—George A. Yager.

#### Syracuse, N. Y.

Sir:—The Standard Release Print is a fine idea and I'm for it. However, there are two improvements which I would like to see added. First, give us a transparent dividing line between frames on all blank film. Second, give us sound-on-film prints in 1,500- to 2,000-foot lengths. Devise some method whereby short reels can be doubled without injury to the subject. There are many men working their jobs alone and it is absolutely necessary that they double reels.

We should have more time between thread-ups, and doubling will enable us to use the portholes for something besides changeovers.—C. E. Linstruth.

#### Tacoma, Wash.

Sir:—Your letter of recent date with pamphlet of "Standard Release Print Makeup and Practice" was received some time ago and has been brought to the attention of members of Local 175. Several Standard Prints have been received here lately and all members who have used them wish to commend the work of the Projection Advisory Council.

Working at the R-K-O-Orpheum Theatre with Western Electric equipment I have had the pleasure of screening three of the Standard Prints. The first print used, "The Silver Horde," omitted the start and cut over cues, the last two, Columbia Pictures, were 100 per cent. We are now running "Sin Takes a Holiday."

The start and changeover dots are perfect with our equipment and a great deal of extra work is saved the projectionist, and programs arriving late, which often happens, are given a perfect preview. Local 175 wishes to thank the Council for this progressive step and pledge our co-operation in any movement for better results in our daily work. A perfect change-over with no sound lost is a big start in the right direction.—W. G. Sloan, Secty. L. U. 175.

#### Connellsville, Penn.

Sir:—Your copy of "Standard Release Print Makeup and Practice" and letter of October 31st at hand. The projectionists of this Local have read the copy of this booklet and find it to be of very great assistance to any projectionist who follows the suggestions and instructions contained therein. If all release prints were made according to the chart printed on pages 4 and 5 of this booklet and kept in that condition, there would be no excuse for bad changeovers. We believe that if every projectionist would do his part in insisting upon standard release prints and giving same proper care while in his possession, and by reporting any damages of the print to the exchange from which it came, projection of both sound and picture would be very greatly improved in all theatres using the Standard Release Print.

This is the greatest step ever taken towards the betterment of film conditions and improvement of changeovers in sound pictures. We, therefore, wish the Standard Release Print Makeup and Practice a very great success and offer our services and cooperation in making it such.—Arthur Wilky, L. U. 177.

#### Harrisburg, Penn.

Sir:—It has been my intention for some time to write you relative to the Standard Release Print. I wish to compliment all those who had a hand in the promulgating of this step, which is surely in the right direction, but I particularly wish to compliment and congratulate you for your work in seeing that it was presented to



the men. Any new move or standard is generally criticized and I would feel that things were too good if there are no knocks; but as a whole I believe it to be a step in the right direction, even if improvements come along later, which is to be expected.

The knockers and boosters very seldom do any work; it is the go-getter who does; so I hope you feel elated over the job that has been done for the projectionist as pertains to the Standard Print markings.—*Lawrence J. Katz, I. A. Representative, District 4.*

#### —Minneapolis, Minn.—

Sir:—I think the new Release Print is a distinct forward step, the value of which increases in proportion to the number of changes of program per week in a theatre. While we are on this subject of prints, why do we still get prints from exchanges which are wound the forward end to. The many things some of us have to do in a very limited time—getting footage, changing to our own reels, our own fast inspection, and seeing that cue marks are on the print—sometimes makes it necessary to rewind twice. This may not mean much to the "one-a-week" projectionist, but to those of us who change three and more times weekly it means a lot.—*Roy Amtson.*

#### —Camden, S. C.—

Sir:—A few days ago we received our first Standard Print and I must say that it is a great improvement over the old click system. Will this new system apply also to short subjects? We have had several "shorts" from M-G-M and found the dots therein, but "shorts" from other companies do not have them. It is a pleasure to run this new print, as we don't have to contend with paper stickers, scratches, and punch marks. I for one wish the new Standard Print success.—*J. E. Ross.*

#### —Billings, Montana—

Sir:—The "Standard Release Print Make-up and Practice" was presented to our members. Having already handled a few of them, they were more or less familiar with them and were very glad to learn that the practice was to be used universally. We have no criticisms to offer as yet. What is needed now is a lot of co-operation between projectionist and exchanges.

Rest assured that Local 240 will do all they can to make what seems to be the best things that has happened yet—a success.—*M. B. Hall, L. U. 240.*

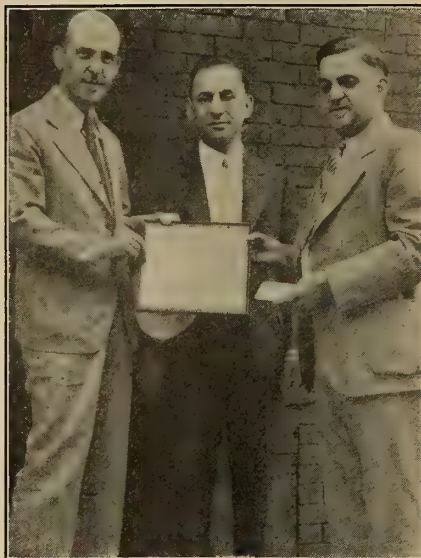
#### —Brocton, Mass.—

Sir:—Your letter of November 5th on the Standard Release Print received and contents noted. The subject came up for discussion at our last meeting and was favorably received. Several of our members were already acquainted with the system previous to its being distributed. Paramount has been using it for the last five or six releases. It is perfect in every way, if the projectionists will make sure that they know exactly the pick-up time of their projectors. That is a simple matter.

#### Suggests Damage Charges

The method was so well thought of that houses that always doubled up film prints have agreed to discontinue the practice. The Publix houses have cooperated in that respect from the beginning. The only thing that can mar the operation of the system will be those who still persist in cutting the beginnings and ends of reels. As a remedy for that abuse I would suggest that the distributors charge the offenders the cost of a new leader and a new trailer for each reel cut. That is the only way that the system can be maintained. If the cutting practice is disregarded in the future as it has been in the past, the system will fail. It cannot be otherwise because if any part of the footage is missing, we will be back where we started.

In conclusion, Local 437 wishes to go on record as favoring the plan as outlined



Membership Chairman J. Cifre presenting P. A. C. certificate to Congressman William Connery of Massachusetts

above. Charge the offenders for the damage they are doing.—*George L. Henault, Secty. L. U. 437.*

#### —Hollywood, Calif.—

Sir:—Relative to the placing of black spots on the end of reels for the purpose of changeovers now being adopted by some of the producers of feature films, for years the projectionists have tried to have clear pictures on the screen without any form of film mutilation being visible to the audience. I believe that the adoption of these so-called changeovers spots is a step backward instead of being an asset to the

projectionist. The Theatre Engineering Service of Los Angeles is now selling to the trade a device known as a cue meter which tells the projectionist at a glance the amount of film left to be run off of each projector, and is so designed that by first measuring the film and setting the cue meter, projectionists are in a position to make all necessary fader changes, changeovers and curtains without any film mutilation.

I earnestly believe that through your publication you should do your utmost to abolish this mutilation of film and help the projectionists who are progressive to keep off the screen all forms of changeovers which are visible to the audience.—*C. Harden.*

#### Tips on Battery Care

It has been discovered by many theatres that the two 45-volt dry "B" batteries, which are used to supply potential to the photo-electric cell and also supply plate potential to the p. e. c. amplifier, are giving very short life. Most "B" batteries are not used immediately after they are made, but remain on the shelf or in storage for several months.

Actually the modern battery loses but a small part of its capacity; however, it is interesting to know that temperature has a very important effect on the depreciation of the battery. The figures on battery life are based on normal operating conditions. Never test the dry "B" battery by shorting the terminals to see if you get a big fat spark. Increasing temperature increases dry "B" battery depreciation by accelerating evaporation and zinc corrosion. Low temperatures reduce battery depreciation.

### Film Technical Progress in 1930†

THROUGHOUT the spring and summer of 1930 a gradual increase was noted in the efforts to establish the sound picture as a medium of good entertainment and lift it out of the realm of pure novelty. Many of the problems which faced the director and cameraman have been solved, and it has been possible for them to give more attention to the artistic and dramatic phases of the picture. Installations of unsatisfactory sound equipment made during the past two years in the studios and theaters were rapidly being replaced by standard reliable apparatus.

An encouraging sign of the times is the evidence of greater collaboration that exists between the producing organizations and the engineers in relation to the study of problems dealing with standard practice, such as camera silencing, release prints, and allied matters. The willingness of the producing companies to pool their knowledge and work with the technical committees of the Academy and this Society should result in a lowering of production expenditures when the knowledge gained is applied to practice.

Further progress has been made on the large picture problem, and, although final agreement still remains to be made on film width and picture shape, the engineering details have been settled and the outlook is hopeful for an early compromise on the remaining questions. In the meantime, most of the major producing organizations have made one or more pictures on wide film during the course of regular production and much valuable experience has been gained. One scheme that appeared to be gaining in favor was the plan of making the negative on wide film, printing by optical reduction on 35 mm. film, and projecting a large picture with a short lens.

Satisfactory international settlement of certain patent difficulties in European countries has encouraged the producers and exhibitors abroad to invest more heavily in sound equipment and installations were proceeding at a rapid pace. A marked demand was evident for pictures in various countries in native dialog.

Equipment such as cameras, lights, set materials, etc., for making pictures has been rigorously examined by recognized committees, to determine their best design and com-

(Continued on page 36)

† Abstract of S.M.P.E., 1930 Progress Committee report.



## New Equipment and Appliances

### Automatic - Portable Projector By RCA-Auto Cinema Corp.

As an inevitable result of the progressive change that revolutionized the motion picture industry when audibility supplanted the printed title in screen entertainment, a novel automatic advertising projector, designed to accommodate standard-sized sound motion picture film, has been perfected and will soon be introduced to the public. The new device is the product of RCA Photophone, Inc., in collaboration with the Auto Cinema Corporation, which has had a silent motion picture advertising projector on the market for several months. The machine itself, a compact piece of engineering workmanship operates within a neatly modeled metal housing occupying a space less than two feet square.

The projector is motor-driven with power supplied from an ordinary lamp socket. Projector amplifier, motor and six-inch speaker are contained within an attractively designed cabinet, similar in appearance to a radio console, which stands about five feet six inches high. The picture is thrown upon a transparent screen, eighteen by twenty-two inches in dimension near the top of the cabinet and in the line of vision of the average-sized person when standing. The entire equipment, including cabinet, weighs less than one hundred pounds. When placed in operation, the film is endless self-rewinding, permitting repetition of the subject indefinitely. The sound amplification can be controlled to any desired volume.

#### Has Many Applications

"We are elated over this latest development of our engineering department", said Sydney E. Abel, general sales manager of RCA Photophone, Inc., in discussing the new advertising projector. "When the Auto Cinema silent projector was brought to our attention, we saw its possibilities as

an advertising medium, but believed it could be converted into a still more potent medium if sound were introduced. This having been accomplished, we believe we have succeeded in perfecting a device that will be exceedingly attractive to national advertisers in all fields. For the motion picture theatre it should be particularly essential. Placed in the lobby of the theatre, the new projector would maintain a continuous performance in the sound reproduction of advance trailers or selected sequences from current attractions. It is our opinion, however, that advertisers of standard products of every description will find the projector a great medium. Conveniently placed in hotel lobbies, railroad stations, auditoriums department stores for style exhibitions, or in fact any place where crowds congregate, it would be bound to attract interest and attention."

The cabinets for the projector are being manufactured by the RCA Victor Company, Camden, N. J., and it is expected that models for public demonstration of the equipment will be completed within the next two weeks. The machines will be leased by Auto Cinema Corporation and serviced by RCA Photophone, Inc.

### Bell & Howell Introduce New 16 mm. Reproducer

A special microphone arrangement which will enable the operator to interject remarks relative to any picture which is being shown and to have his voice come from the loud speaker in entirely satisfactory volume, is hailed as a revolutionary feature of the new Bell & Howell portable 16mm. talkie reproducer, the Filmophone. This new combination is especially valuable for business, educational, church and small theatre use. It will also find favor in the home.

The Filmophone itself is portable in the true sense of that word. It comes in two cases, of approximately equal size, shape and weight, totaling



W. E. 25-C amplifier (deaf set), at rear of 213-A panel

88 pounds. It employs a Filmo Projector for showing pictures, using 16 mm. amateur size film. Sound is obtained by a synchronized phonograph type of disc, the same as used in theatres.

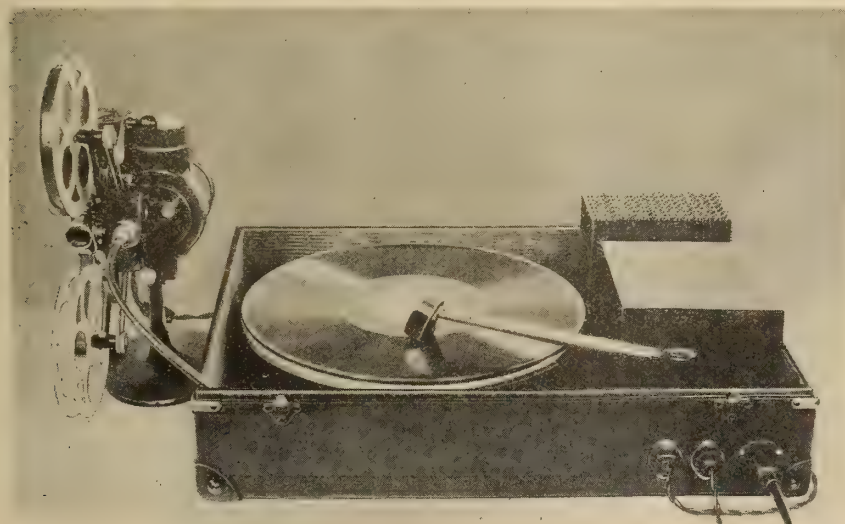
The Filmophone produces volume sufficient for audiences of several thousand. With it perfect synchronization is achieved with greatest ease. It has a worm drive of unique design, thus eliminating the double-motor feature and avoiding any possibility of slack in the mechanical coupling which would, of course, destroy synchronization. The microphone feature permits the operator to plug in conveniently at any time, automatically cut out the musical or verbal record accompaniment and make any comments desired in order to emphasize points of a film which may need stressing to meet a specific situation. When a switch on the microphone is released the record sound accompaniment is resumed.

One of the two cases which house the Filmophone contains turn table with flexible shaft connection to the Filmo Projector, magnetic pickup, amplifier with power pack, tubes, needles, needle cup, pocket for three 16 inch records, and necessary accessories. The second case houses the loud speaker permanently mounted in the case itself, together with the Projector, three extra reels of film, empty reel, connecting cords, cables and accessories.

### DeForest P. E. Cell

Two photo-electric cells are announced at this time by the DeForest Radio Company of Passaic, N. J.

The DeForest photo-electric cell No. 602 is of the potassium hydride



Bell & Howell 16 mm. portable talkie combination



type. The active surface is deposited upon the inside wall of the bulb as a cathode, while a wire ring in the center serves as the anode. The essential characteristics are: *Bulb*, spherical, 2" dia. *Base*, large UX. *Window*, circular, 1 sq. inch area. *Anode* connected to grid terminal of UX socket. *Cathode* connected to right-hand filament terminal of UX socket. *Anode Voltage*, 130 volts maximum. *Ionization Voltage Dark*, 200 volts. *Photo-electric Sensitivity* at 90 volts, 3.5 to 7.5 microamperes per lumen.

The DeForest photo-electric cell No. 668 is of the caesium argon type. The active surface is deposited upon a half cylindrical silver-plated cathode, while a straight wire at the axis of the cathode serves as an anode. The essential characteristics are: *Bulb*, tubular, 1" in diameter, 2½" long. *Base*, small UX. *Cathode*, intercepts area of light ⅝" by 1¼". *Anode* connected to plate terminal of UX socket. *Cathode* connected to left-hand filament terminal of UX socket. *Anode Voltage*, 90 volts maximum. *Photo-electric Sensitivity* at 90 volts, 35 to 77 milliamperes per lumen.

### Simplex Adjustable Shutter

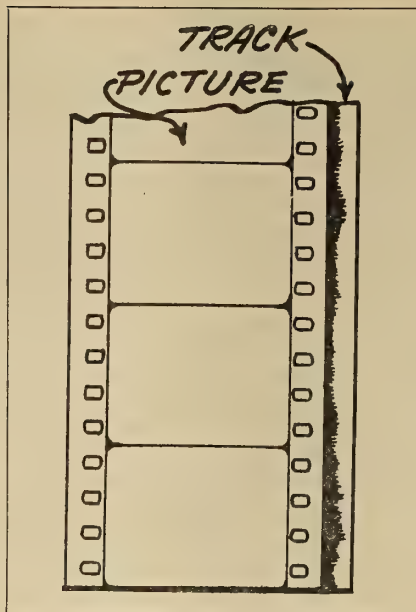
A new adjustable shutter blade has just been introduced by the International Projector Corp. and is now a part of all Super Simplex mechanisms and rear shutter assemblies for regular mechanisms. The adjustable shutter is also supplied to replace shutters heretofore furnished with Super Simplexes and rear shutter assemblies.

The new adjustable shutter permits the width of the blades to be varied at will to suit projection conditions. The blades are of a minimum width of 91 degrees when the adjustable blade is lapped completely over them and normally this is a satisfactory width for the shutter. In many cases, however, the area of light beam varies with the different types of illuminants and sometimes travel ghost is present.

With this new adjustable blade it is possible to eliminate travel ghost under all conditions and it will be found of great advantage in improv-



New Simplex Adjustable Shutter



Re-positioning the sound track

ing projection conditions. The excessive cost of redesigning the motion picture projector prevents bringing out new models as frequently as might be desired, but the various improvements and refinements which are added to the Simplex brings the machine up-to-date and meets the requirements of the progressive projectionists.

### All-Metal Inspection Table

An all-metal inspection table, characterized as the last word in serviceable quality, is being marketed by the Atlas Metal Works, of Dallas. The top projects over the legs, which are of heavy, tapered galvanized iron. There is a drawer for each operator furnished with two film cabinets and excellently finished.

### Re-Position the Sound Track

Editor, *Motion Picture Projectionist*. Sir: From time to time I have noted in your magazine some very interesting comment on the subject of wide film. Some of the "authorities" on the subject state that the 35 mm. film would suffice for all regular needs and obviate the necessity for the introduction of wide film if—if the sound track as at present constituted did not reduce the picture area.

This being the case, why not locate the sound track outside the picture area as shown in the accompanying sketch? The 35 mm. sprockets and standard aperture could be used and all sound track masks, dual focus lenses, and flippers would not be needed. The picture would always be the same size, whether using sound-on-film or disc. What a blessing this would be!

Then, too, the sound track would be removed from the intense heat of the aperture and would not be as liable to warping. The track, passing outside of the aperture, would not be so easily scratched, or otherwise damaged, as it would not come into contact with any idlers, rollers, pads, or

masking plates. It might be said that the sound track, being on the edge of the film, would be easily damaged. Of course, there is no excuse for tearing and catching the edge of the film between the edges of the reels when rewinding or inspecting. At least, the sound track side of the film, with regard to the sprocket holes, would probably be stronger than the opposite side of the film.

I should like very much to have the comment of a number of readers on this interesting subject.—*John H. Weaver, Pittsburgh, Pa.*

### G-M New Head Amplifier

G-M Laboratories, Inc. announce the development of an improved preliminary (head), amplifier for use with sound-on-film equipment. This amplifier can be used on all makes of sound equipment and because of its small size and the simplicity of installation can be used with either new or old equipment.

The complete unit is mounted in a steel service case, permitting the wiring through rigid or flexible armored conduit. The chassis proper is white alloy metal, offering a very attractive appearance. Electrically, the amplifier has a very flat frequency response characteristic, assuring equal volume output at all audio frequencies. The tube support is of heavy cast-brass supported by four steel springs, absolutely eliminating any possibility of microphonic noise. Electrostatic shielding is accomplished by complete enclosure of all parts including tubes.

Other features include variable cell voltage control, which permits adjustment of the photoelectric cell output for best quality and minimum background noise; adjustable inter-stage gain control; jacks for testing cell voltage and plate current; on-and-off switch which controls all battery supply; and low "A" and "B" battery drain.

The over-all gain of this amplifier is rated at 40 d. b. at the 500-ohm output transformer, which may be connected directly to any standard fader.

Overall dimensions of the service box container are height, 12½ inches; width, 9 inches; depth, 6 inches.



G-M's new head amplifier



## Everyday Science

### To Have Disease Without Knowing It May Save Lives

The idea that mild attacks of germ disease which people acquire and get over without ever knowing that they have been sick at all may be very important factors in public health is suggested by recent studies of the germs of infantile paralysis reported to the London medical periodical, the "Lancet," by Dr. R. W. Fairbrother, of the Lister Institute, London, and Mr. W. G. Scott Brown, of the Sevenoaks Hospital.

Experts already had discovered that the blood fluid or serum of a person who has had infantile paralysis and has recovered from it is inimical to the germ of the disease, the human body evidently being able to manufacture as a protection against the germ some blood chemical which fights and destroys it. Dr. Fairbrother and Dr. Scott Brown now find this same germ-fighting power in the blood serum of persons who were exposed to infection with infantile paralysis but who apparently did not take the disease.

What happened, the British physicians believe, is that a few germs of the disease actually did enter the bodies of these individuals but were repelled and killed by the body's defences. The stay of these germ invaders apparently lasted long enough, however, to stimulate the body's production of the germ-fighting chemical produced in an actual case of the disease. Such very mild, symptomless cases of various germ diseases may be occurring all the time among the general public, experts believe, and operating to protect such temporarily invaded individuals against more serious germ infections.

### Ball Lightning May Explain Myths of Vanishing Devils

Another example of the rare and mysterious variety of explosive electricity called "ball lightning" has been reported to the British Meteorological Office, in London, by Mr. Edward Kidson, of Wellington, New Zealand. Late in the afternoon of one day last June, that being the winter season in the southern hemisphere, a Mr. M. J. O'Sullivan was seated in the kitchen of his home in a suburb of the city of Auckland, talking with his mother. A gas stove was burning in one corner of the room. An electric lamp hung on a cord near the room's center. Suddenly there was a loud explosion and a bright yellow flash, apparently in empty space mid-way between the gas stove and the electric lamp. No dam-

age was done and neither Mr. O'Sullivan nor his mother was injured.

Contrary to what often is observed in instances of exploding ball lightning, no sulphurous or other smell was noticed. Rain was falling outside and the gas stove was near an open chimney down which the explosive electrified matter may have come, as ball lightning seems often to do. No further facts are available. Something caused a mysterious explosion in the O'Sullivan kitchen. Probably it was some form of atmospheric electricity. Study of these ball lightning phenomena not only is important, experts believe for electrical science and for meteorology, but is interesting also in the study of folklore, for primitive observations of occurrences like that described by Mr. Kidson may well have been the cause of the common popular idea of devils or other supernatural creatures appearing mysteriously and vanishing with a loud bang, a flash of light and a sulphurous smell.

### Construct Novel Ray Lamp

Ultraviolet ray lamps to be swallowed, as one might swallow a pill on a string, to provide curative rays for ulcers of the stomach or similar diseased conditions, have been devised in Europe; notably by Dr. S. Westmann, of Berlin, Germany, and Dr. Husserl and Herr Babler, the latter an electrical engineer, of Vienna, Austria. Ultraviolet rays applied to the surface of the body do not penetrate the flesh as X-rays do but are stopped by the outer sixteenth of an inch or less of the skin. In the effort to use the germ-killing and other curative

actions of these rays internally, rods and tubes of clear quartz have been made, intended to be thrust down the throat or into other body cavities and to lead in the rays from ultraviolet lamps outside the body.

There are difficulties, however, about introducing such solid rods into ordinary people, whatever might be true for a professional sword swallower. German and Austrian physicians and engineers now have constructed, therefore, very small ultraviolet ray lamps in quartz capsules not much larger than a capsule for drugs. These are connected to flexible wires inside a rubber tube, which the patient swallows also. The electric current then is turned on and rays generated from the swallowed lamp bathe the whole lining of a diseased stomach, for example, in curative radiation. When the treatment is over the capsule-lamp is withdrawn by means of the wires on the rubber tube.

### Negroes' Nerves Larger and Faster Than Whites

Negroes have larger nerves than white people, thus providing another piece of scientific evidence for the opinion of many anthropologists that the negro race is more highly evolved than the white one and that negroes have diverged more than whites from the primeval human stock.

The new facts about comparative sizes of nerves have been discovered by Mr. Hiro Ide, of the Wistar Institute of Anatomy and Biology, in Philadelphia, who measured cross sections from corresponding parts of the sciatic nerves of 21 white males and 29 negro males. The sciatic nerve is the large nerve in the thigh, supplying the greater part of the foot and lower leg and being the nerve which sometimes suffers the painful inflammation called sciatica. Both the sizes of the entire nerves and the sizes of individual nerve fibers of which the nerves are composed were measured. Both were found notably larger in the negroes.

Comparing males with females, Mr. Ide found, also, that female nerve fibers are individually larger but that female nerves as a whole are smaller, the reason being that the female nerve contains a smaller percentage of mere connective tissue not involved in the nerve's duty of conducting stimuli. It is probable, Mr. Ide believes, that the speed with which messages pass over nerves is greater the larger the nerve fibers, so that the negro nervous system may be expected to work a little faster than that of the white.

*Strange is our situation here upon earth. Each of us comes for a short visit, not knowing why, yet sometimes seeming to divine a purpose. From the standpoint of daily life, however, there is one thing we do know: that man is here for the sake of other men—above all for those upon whose smile and well-being our own happiness depends, and also for the countless unknown souls with whose fate we are connected by a bond of sympathy. Many times a day I realize how much my own outer and inner life is built upon the labors of my fellow men, both living and dead, and how earnestly I must exert myself in order to give in return as much as I have received. My peace of mind is often troubled by the depressing sense that I have borrowed too heavily from the work of other men.*

—ALBERT EINSTEIN.



# There's No Substitute for Crisp, White Light



**HIGH INTENSITY  
AUTOMATIC  
REFLECTOR  
ARC LAMPS**

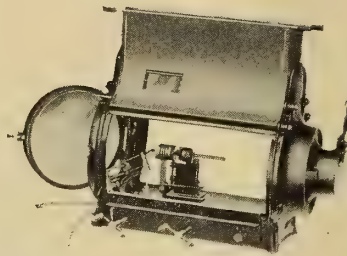
provide an abundance of light for proper projection on

**ENLARGED  
SCREENS!**

Buy Only That Equipment Which Incorporates All  
Up-to-the-Minute Improvements.

*For Sale by Independent Supply Dealers*

**The Strong Electric Corporation**  
2501 Lagrange St., Toledo, Ohio



## Universal Film Splicing Machine

**MODEL NO. 3**

Pat. March 22:22

First-Class Results on New or Old Film  
Permanent Gauge

No Adjusting

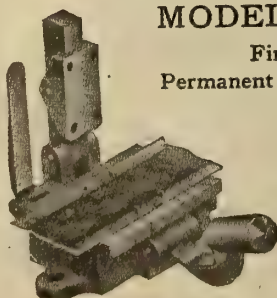
**FOR THEATRES, EXCHANGES  
LABORATORIES, SCHOOLS**

**Price \$6.00**

**GENERAL MACHINE CO., INC.**

.816-826 East 140th St., NEW YORK, N. Y.

*For sale by all Supply Dealers*



## Technical Progress in 1930

*(Continued from page 32)*

position for improving sound picture quality. Sound-on-film recordings appeared to be gaining in favor over disks as a result of better technic in recording the sound and processing the records, as well as the advantage of having sound and picture as an integral unit.

The use of two sound track records run simultaneously on "dummy" projectors apart from the picture projector has been given a satisfactory trial under regular performance conditions and is believed to offer a means of improving the sound quality of very loud sound effects. Special amplification and extra horns were used. The frequency range of loud speakers has been extended and one type, when used as an adjunct to the ordinary style, makes possible uniform reproduction of sound from 50 to 11,000 cycles.

Further data have been compiled on acoustics of theater auditoriums as well as on the sound characteristics of screens and special instruments devised for measurement of critical factors.

Interest in television has increased rapidly during the past few months in this country and abroad. Two public demonstrations were given as part of regular theater programs, one of which ran for a fortnight at a London variety house. Other showings were scheduled for this fall in Berlin and Paris. A leading experimenter has stated that television has now progressed to about the same degree of development as radio in 1915. Much is expected therefore from this new entertainment medium and authorities predict that it will be an asset rather than a liability to the motion picture industry.

Color as an adjunct to sound pictures appeared to have been oversold to the public during the past year but steady improvement has been noted in the quality of pictures by subtractive processes which continued to have the chief commercial distribution.

## Films and Emulsions

Plans for ultimate adoption of wide film have continued throughout the summer as several producers were known to be engaged actively in further experimentation. According to reports from production centers, negatives for several pictures have been made on wide film as well as on the usual 35 mm. width. Agreement has been reached among leading producers on perforation standards and sound tracks but there is still a division of opinion on total width and size of frame. One immediate solution of the projector problem is to make the negatives on wide film and make reduced prints on 35 mm. for showing on the present standard projector fitted with a



shorter focal length lens. Some of the advantages as well as limitations of this scheme were discussed by Finn. Installation of large screens in several theater circuits has been undertaken as well as provision for such screens in the newly constructed houses. A survey indicated, however, that about 60 per cent of the theaters lack space for screens of more than 24 foot width.

The first of a series of conferences on wide film problems was held in Hollywood in September under the auspices of the Academy of Motion Picture Arts and Sciences. These sessions are devoted to the production aspects of the problem rather than to the engineering phases.

According to Sponable, the intensity range above ground noise will be increased with wide film. Since the running speed is raised from 90 feet per minute to 112, the frequency band will be raised from 9,000 to 11,200 cycles.

Sound motion pictures in color continued to be used rather extensively although production of new feature color pictures appeared to slack up during the early summer. No new film emulsions, however, were known to be in use for color motion pictures and two-color subtractive processes were chiefly used. Two types of color charts have been made available on the European market for determining the characteristics of orthochromatic and panchromatic emulsions.

#### Sound Recording

A conference held in Paris in July, 1930, between American and German interests resulted in an agreement on territorial distribution of sound motion picture equipment. The agreement is stated to provide for complete interchange of American and German patents and manufacturing and technical information. Equipment manufactured under the new agreement will be suitable for showing sound films of either German or American origin.

Sound film records made in England at the Wembley studios are identified by photographing at intervals on the film, a lantern slide carrying the scene and shot numbers. Each half minute, figures up to 10, in Morse code, are printed on the side of the film opposite the sound track. Corresponding figures are recorded on the picture negative in the space reserved for the sound track.

The causes of feed-back in amplifiers have been reviewed by Schroeder who states that it may be avoided by using proper filtering devices. Goudy and Powers have made a very interesting study of sound recordings on both disk and film, treating the relation between needle diameter and frequency, needle pressure, pick-up distortion, slit-width vs. frequency, and a comparison of film and disk records. Considerations affecting the

*Any picture can have this  
charming, atmospheric*

## COLOR

**EVERY** mood of the screen can be expressed in charming, atmospheric, over-all tints, by means of Eastman Sonochrome Tinted Positive Films. They reproduce sound with striking fidelity, being designed especially with this function in mind. Best of all, they can be used in any picture, for they cost no more than ordinary black-and-white positive film.

**EASTMAN KODAK COMPANY**  
ROCHESTER, NEW YORK

**J. E. Brulatour, Inc., Distributors**  
New York      Chicago      Hollywood

### IN WESTERN CANADA! CANADIAN THEATRE SUPPLY CO.

Authorized distributors for  
**SIMPLEX—MOTIOGRAPH—POWERS—HOLMES**  
and all theatre equipment of the leading manufacturers. Also, an extensive line of stage equipment.

**Complete Sound Picture Service!**

**306 Canada Building**  
Winnipeg, Man., Canada

Alberta Representative

**M. L. ADAMSON**

9921—113th St., Edmonton, Alb., Canada



design of phonograph needles were discussed by Friebus at the Washington meeting and a method of shadowgraphing the points described.

At a sectional meeting of this Society, Cook presented a mathematical analysis of the effect of the finite size of recording and reproducing slits as well as the effect of lens aberration on aperture width. A beam microphone which may be focused on one speaker has been perfected by a Hollywood sound director. It consists of a parabolic metal reflector about 5 feet in diameter with the usual condenser microphone placed at the focus. A cylinder of felt is placed around the outer edge. The device has proved of special value for outdoor recording where it is desired to eliminate extraneous sounds.

Besides the variable width and variable intensity methods of sound recording on film Cauda states there is a third method available in which the time of exposure of the light sensitive emulsion is made the variable. It is shown that the density variation on the film is proportional both to intensity and frequency. Tasker has presented a useful analysis of the causes of ground noises in disk and film records.

At the 1930 spring meeting of the Society, Evans gave a summary of the advantages and limitations of disk and film records. His conclusions were that, although film recording is theoretically superior, its advantages

are not realized as readily in practice. Nevertheless, many of the large companies appeared to be encouraging the use of film records. Two large equipment manufacturers during the summer of 1930 announced lower prices on sound-on-film equipment and the option of purchasing the general installation without the disk. One producer who supplied disk records exclusively began early in the summer to supply sound-on-film features as well. It is considered by some exhibitors that film records "wear" better than disk records and have noticeably less of a metallic note when played. Projectionists are also a bit careless in replacing old needles and distributors occasionally do not supply new disks quickly enough to replace worn ones. Loss of parts of the film cannot be eliminated from the disk and the picture is thrown out of synchronization. There are 3,500 theaters, however, equipped only for disk records and it will undoubtedly require at least two years to effect a complete change-over.

A revision of the National Electric Code is reported to be in progress affecting requirements as to wiring for sound recording and reproduction.

#### Exhibition Progress

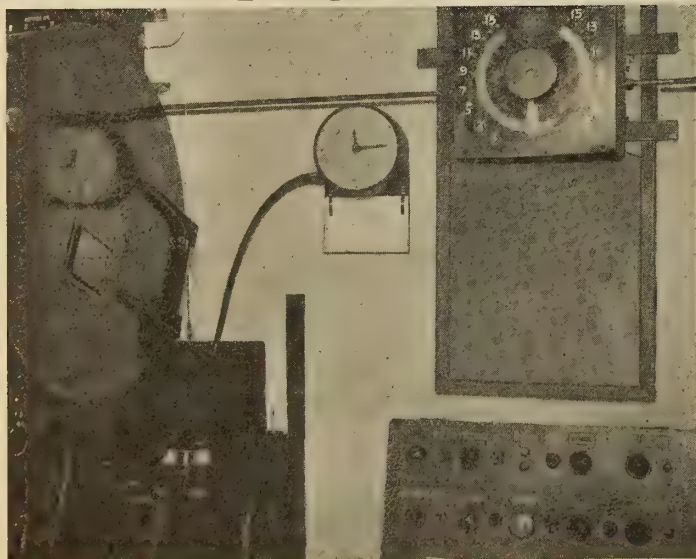
According to trade reports orchestras which were discharged upon the installation of sound equipment have been returned to a few theaters in this country and South America. An

inventory of several leading theaters on the Pacific Coast reveals, however, that certain houses appear to have a patronage who wish orchestras and shows whereas others have a patronage who prefer a first class selection of pictures. It appears to depend, therefore, largely on the type of clientele a theater enjoys.

In the readjustment from silent productions to sound productions, the average producer had so many technical problems to consider that many traditional considerations of both production and showmanship were forgotten. The bulk of the large technical problems has now been solved and routine production is under way. Greater attention has, therefore, been given to planning entertainment for different ages and particularly the youth of the nation as it is realized that these sections of the patronage later grow to become the mature sections.

Sound motion pictures have introduced certain fundamental changes in the previous order of motion picture programs. Overtures played by an orchestra have largely been eliminated, the value of the news reel enhanced, the value of comedies lessened, but greater importance has been given to cartoons. Short subjects which were merely used to introduce a vaudeville team, though at first popular, are fast losing appeal, perhaps because vaudeville has limited

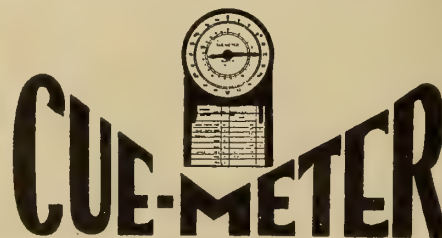
# IMPOSSIBLE ..



## YET IT WAS DONE.

To demonstrate the accuracy and dependability of the Cue-meter an entire performance was put on in one of the largest theatres on the Pacific Coast WITH ALL OBSERVATION PORTS CLOSED thereby making it impossible for the projectionists to see the screen.

Even with this unheard of handicap the fader cueing and change-overs were perfect. This procedure is not recommended but it definitely illustrates the accuracy of the Cue-meter.



Ask your dealer or write for further information  
**THEATRE ENGINEERING SERVICE COMPANY**  
 1442 Beachwood Drive Hollywood, California

**DON'T GUESS ... USE CUE-METERS**



appeal at the present time. The general length of program remains one of approximately two hours' duration.

#### General Projection Equipment

Descriptions have been published of several foreign makes of projectors. The Ernemann projector now uses a more powerful light source and has moved the shutter blades near the film, somewhat as used in the Simplex. A new projector built by Bauer has incorporated several improvements. Joachim has dealt with the development shown in projector design during the past ten years.

Ozaphane film is stated to be finding use in France in theaters which as yet do not have projectors for standard film. It is claimed that such film may be projected over 3,000 times without appreciable wear.

Several patents have been granted on improvement in projector design, which describe, among others, (a) a means for splicing on a new reel during the projection of one film, thus eliminating the necessity for two projectors, (b) a method and apparatus for releasing an odor or odors in the theater especially associated with the visual images of the picture, and (c) a projector which is quickly adjustable for either amateur or professional standard motion pictures.

#### Sound Picture Reproduction

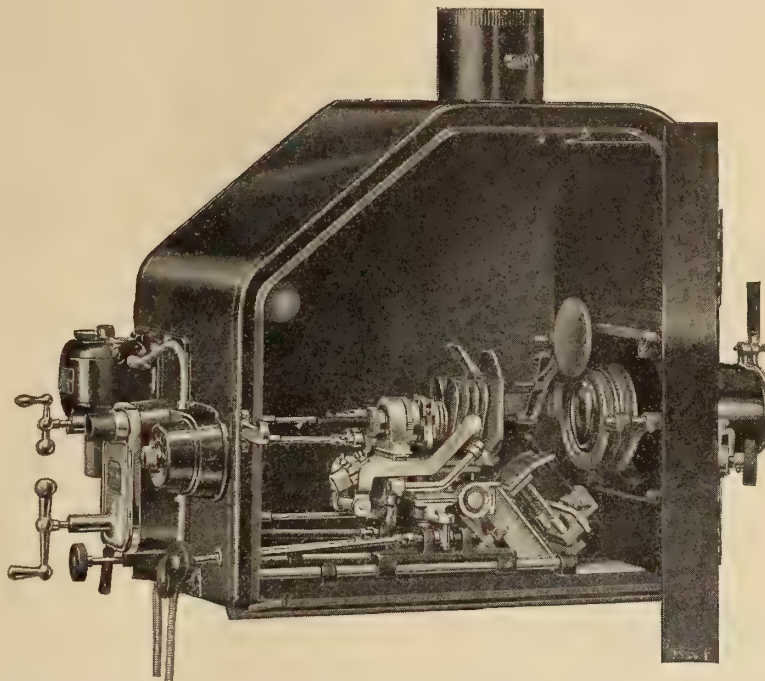
About one-third of the motion picture theaters of the world had been equipped by September, 1930, for sound reproduction of either the synchronous or non-synchronous types. In proportion to the total number of theaters, Canada leads the list of countries with 70 per cent sound installation, and the United States is second with 55 per cent, Great Britain, third, with 47 per cent. Trade reports from the Motion Picture Division of the U. S. Department of Foreign and Domestic Commerce indicate that European theaters are rapidly converting their old equipment over for use with sound pictures.

Equipment difficulties are slowly being eliminated in theaters, one firm reporting that 88 per cent of their installations were giving satisfactory quality at the horn mouth, according to a survey completed in August, 1930.

The prediction made by Edgar that projection rooms in major theaters will be equipped with extra dummy machines for handling film with sound records only, has been realized in the showing of the feature production, "Hell's Angels," at the Chinese Theater, Hollywood. Volume with less distortion, elimination of troubles from heating of the film, and a lowering of projector vibration are some of the advantages cited by Edgar. Three dummy projectors connected in parallel were used in the Chinese Theater demonstration so

# ASHCRAFT

## SUPER HIGH INTENSITY PROJECTION LAMP



**T**HE ASHCRAFT Super High Intensity Projection Lamp is now used as a projection standard where exceptionally fine projection is required. Not only is this lamp superior for wide film, but is now being used with standard film in the largest theatres with an enormous increase in illumination.

*Catalog is now available for distribution*

**ASHCRAFT AUTOMATIC ARC COMPANY**

4214 SANTA MONICA BOULEVARD

HOLLYWOOD, CALIFORNIA

### WIDE FILM PROJECTION

*Requires*

## S. O. G. GRAND SPECIAL CONDENSER SYSTEM

Parabolic cylindrical curves create more light and produce an oval spot  
Also adaptable to Standard Film Projection with slight changes

### FISH-SCHURMAN CORPORATION

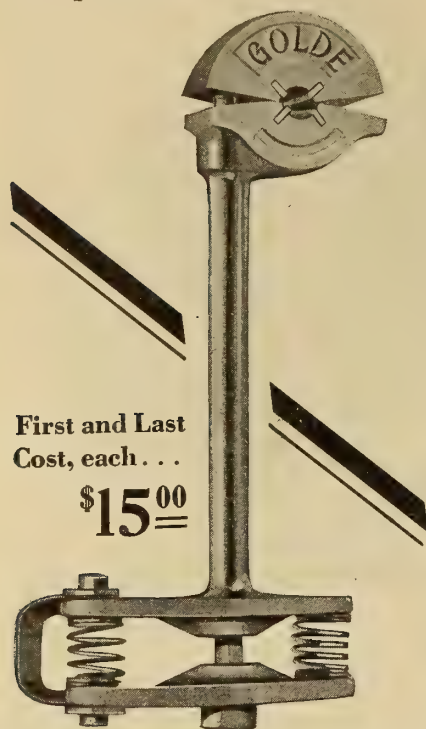
45 West 45th St.  
New York

6364 Santa Monica Blvd.  
Hollywood, Cal.



# Guaranteed Six Months

1000 hours  
of operation



First and Last  
Cost, each. . .

**\$15<sup>00</sup>**

## LONG-LIFE JAW FOR HI-LO LAMPS

Stop cussing your Hi-Lo lamps for their carbon jaw weaknesses. Quit spending time and money for useless replacements and repairs. Put on a set of GoldE Long-Life Carbon Jaws RIGHT NOW and start being thankful for what GoldE has again done for you. Order a pair now and get a GoldE Carbon Jaw Lap FREE.

# GOLDE

Manufacturing Company  
2015 LeMoyne St., Chicago, Ill.



### Theatre Equipment NEW AND USED

Most complete stock in the U. S. Moving Picture Machines, Screens, Booths, Opera Chairs, Spotlights, Stereopticons, Film Cabinets, Portable Projectors, M. P. Cameras, Generator Sets, Reflecting Arc Lamps, Carbons, Tickets, Mazda Lamps and Supplies.

Projection Machines repaired and overhauled. Repair parts for all makes opera chairs. Attractive 3 x 10 ft. muslin banners, \$1.50; on paper, 50 cents. We Pay Highest Prices for Used Projection Machines, Opera Chairs, etc. Everything for the Theatre—Write for Catalog K. Movie Supply Co., 844 Wabash Ave., Chicago

that two sound tracks could be played at the same time. Six reels of "Magnascope" film were included in the picture which was projected on a 24 by 37 foot screen and 9 extra loud speakers were added to the regular installation which consisted of three horns. A special amplifier system was installed to accommodate the 12 horns, which made possible an increase in volume equal to five times the normal volume of the regular sound installation.

Sound motion picture equipment for rear projection has been installed in an Indianapolis theater. The Powers portable Cinephone has been added to the group of portable sound projectors. An amplifier for an audience of 500 persons is used and a 4½ by 6 foot screen.

### Mobile Sound Reproducers

One of the most interesting innovations in projection equipment of foreign origin is the French Nalpas double projector. Two complete sound-on-film or disk assemblies are mounted compactly on a single rigid support. The smaller British theaters which have not been equipped for sound pictures are to have the sound brought literally to their doors. Mobile, five-ton trucks carrying a standard set for sound projection, including power generators, are being developed so that a silent theater can be fitted up temporarily for sound projection in one or two hours. Screens, loud speakers, and technical staff are supplied.

Peek has presented an interesting analysis of practical problems encountered in sound picture projection and states that less reverberation is desired in the case of reproduced sounds as recordings have already been affected by the reverberation present in the studios. A "live" stage is, therefore, satisfactory if the auditorium is made dead. A new sound head for a motion picture projector is fitted with only one small roller and side buffer which insures correct positioning of the film at all times.

A resynchronizing device of British

origin consists of a footage counter and a dial graduated into 16 sections, each of which corresponds to a frame. The device is attached to the 90-feet-per-minute spindle by a flexible shaft. The footage counter is set to correspond with the edge number on the film and the dial hand is moved to zero. The exact foot and frame passing the aperture can be detected at once, during projection.

The frequency characteristics of a sound film recording and reproducing system have been discussed by Browne with a view to producing a level combined frequency response. A recording system producing a twin wave track variable width record was described. By forming the aperture before the light slit, by the tangential approach of the circumferences of two rotating rings, the problem of keeping the slit clean is claimed to be solved. Wolf and Sette have analyzed the factors governing the power capacity of sound reproducing equipment in a paper presented before the New York Section of this Society.

A power level indicator has been announced for reading the signal amplitude in voice transmission circuits; levels from minus ten to plus thirty-six decibels can be measured. A monitor has been developed to meet the needs for accurate indication of volume levels from power amplifiers in sound reproducing equipment. According to Aceves, amplifiers may be given desired characteristics to compensate for deficiencies in processes of recording and reproducing and an amplifier having such properties is described.

In a new type of sound-on-film reproducer, mechanical parts in the optical path have been substituted for a cylindrical lens which illuminate only 0.0005 inch of the film area, thus eliminating the usual slit. Nason has dealt with the application of photocells in projection work. Characteristic curves published for the gas filled type of photo-electric cell compared with the vacuum type show the former to have nearly five times the sensitivity but the gas filled cell requires

**KEEP all your COPIES of**

**MOTION PICTURE PROJECTIONIST  
AS A REFERENCE FOR CURRENT  
AND FUTURE NEEDS — PRE-  
SERVE THEM IN A  
BINDER**

**\$3<sup>00</sup>**  
**each**

**GOOD SOLID  
IMITATION LEATHER  
—GET ONE**

**ORDER FROM THE MOTION PIC-  
TURE PROJECTIONIST**



more critical adjustment of operating voltage. A new ultra-sensitive vacuum tube has been developed in which the grid current is reduced to a very low value for measurements as low as 10 amperes. Such a tube will indicate a flow of 63 electrons per second.

#### Improved Speakers

One of the weak points of sound motion picture reproducers has been the limited reproducible frequency range of such apparatus. Within recent months, marked improvement in speaker design has extended the range. A new 72-inch dynamic cone speaker and directional baffle have been announced which is claimed to deliver clear mellow low frequency (50 cycle) sounds and high frequency (7,000 cycle) sounds. The sounds "s," "f," and "th" can be distinguished clearly. Another type described by Bostwick utilizes a moving coil piston diaphragm in conjunction with a 2,000 cycle cut-off. By using this speaker as an adjunct to the ordinary type, it is claimed that uniform reproduction of sounds from 50 to 11,000 cycles may be obtained. A brief notice has been published of a new sensitive valve for exponential horns which regulates the flow of compressed air into the small end of the horn and greatly multiplies its effectiveness. A description has been published of a new super power

speaker of German origin which, it is claimed, can be heard clearly at a distance of 15 miles.

Bull has published data on methods of measuring loud speaker efficiency. Good horn type speakers used in theater installation are said to have an efficiency of 35 per cent; ordinary commercial speakers only 1 to 6 per cent. A specially designed audio frequency generator of the heterodyne type was used by Barnes as a means of studying loud speaker performance. Wolff and Malter have shown that the way in which a loud speaker distributes sound energy is a measure of its performance. Speakers for home use should radiate uniformly throughout a hemisphere; those for theaters should possess a characteristic, the limits of which are defined sharply by the edges of the audience. Data have been published by Malter on the characteristics of a large number of directional baffle loud speakers as well as several commercial types.

A disk record containing several hundred grooves to the inch will play for 72 minutes. Fox suggests that shipping problems for disk records would be simplified if these records could be impressed on a lightweight support permitting them to be packed with the film or mailed in an envelope. A new type of record which is said to withstand scratching and other maltreatment is reinforced with an inner layer containing rubber and shellac.

By means of stroboscopic synchronization, the sound from a sound motion picture shown in a theater was transmitted by radio for a showing of a silent print of the same picture at a disabled veterans' hospital. Although exact synchronization was lost at each change-over, it was estimated that the synchronization was within 0.2 seconds for 85 to 90 per cent of the time. Sound pictures have been shown successfully on an ordinary day coach attached to a passenger train, two portable projectors being used.

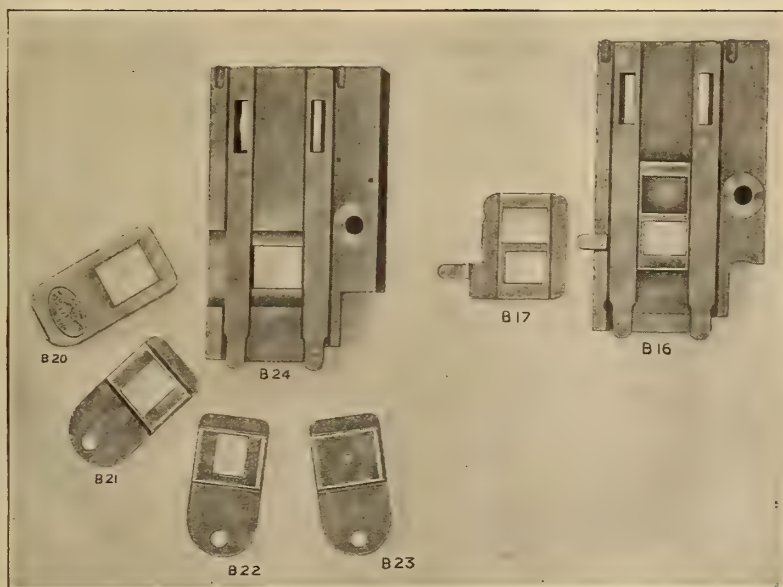
At a meeting of the Société Française de Physique, Dundoyer described a new type of light bulb for sound reproducing equipment. A rectilinear filament is arranged parallel to a flat plate fused in the bulb and a microscope objective used to produce a greatly reduced image of the filament on the film.

Sound reproduction patents issued dealt chiefly with methods of synchronizing the sound and the picture change-over from sound-on-film to sound-on-disk, synchronization of motion pictures and sound transmitted by telegraph or radio, and means for the determination of the particular record groove engaged by a phonograph pick-up at any time.

#### Lenses, Shutters, and Light Sources

Joachim has reported on tests regarding suitable condenser lenses,

## BLUE SEAL HEAT RESISTING IMPROVED FILM TRAPS FOR SIMPLEX PROJECTORS



MADE OF AN IRON ALLOY

Guaranteed not to Warp under the intense heat of the Arc Spot. A necessity for the Perfect Projection of "Sound" Pictures

- |  |         |
|--|---------|
| B-16 Film Traps with Sliding Double Round Corner Apertures, one Aperture for Disc and Silent Film and one cut Proportional for Movietone Film to be used with our Adaptors.... | \$30.00 |
| B-17 Sliding Double Aperture Plate .....   | 6.00    |
| B-24 Film Trap with individual mats for silent, movietone and magnascope effect. Traps complete with all mats.....   | 30.00   |
| B-20 Master Plate to hold mats stationary .....  | 1.50    |
| B-21 Standard Aperture with Square Corners.....  | 1.50    |
| B-22 Proportional Movietone Aperture with Square Corners.....  | 1.50    |
| B-23 Blank Mat (CAN BE CUT ANY SIZE APERTURE)....  | 1.50    |

Manufactured by

# BLUE SEAL PRODUCTS CO., Inc.

262 Wyckoff St.

Brooklyn, N. Y.

Manufacturers of Motion Picture Accessories Since 1913



## Good Projection Requires Good Rectification



M. P. 25-25

## Good Rectification Means FOREST RECTIFIERS

**T**HIS Forest Rectifier meets the demand for a single unit to supply direct current for two projectors, and will furnish 15 to 25 amperes to either projector continuously.

It supplies a steady direct current, free from pulsations, and will produce a better light than other current supply devices. The only wearing parts are the bulbs which will last at least one thousand hours and usually much longer since only two bulbs are being used at a time (except during change over) and the load is alternately carried first by one set of two tubes then the other two as the projectors are alternately used.

This Forest Rectifier embodies the use of four rectifier tubes which are connected to supply current to two direct current circuits independent of each other thus preventing loss of current at the first arc when the second arc is struck.

Both arcs can be operated at the same time during the change over period and there will be no diminishing of the light from one projector while lighting up the second.

Two Ammeters are mounted on the unit which will show at a glance the amperage being used at either arc.

Links are provided for operating from 110-220 or 240 volts.

Rectifiers for all purposes made in 15 amp., 25-25 amps., 30, and 65 amps. sizes.

*We are specialists in our field. Send us your technical problems. Literature on request.*

**FOREST ELECTRIC CORP.**

New and Wilsey Sts.

Newark,

N. J.

mirror arrangements, etc., for projectors. Naumann has treated the problem of the diameter of projector lenses. An optical device has been patented which serves to shift the projected images to the center of the screen and to spread the images laterally to cover the entire screen.

A projection lamp of novel construction is designed so that the upper part of the bulb is spherical, whereas the lower part narrows to a cylinder, near the base of which is the filament. The leads are brought in at the top. Convection currents carry the tungsten vapor to the upper part of the bulb where it deposits. Greater screen illumination is said to be secured from a new lamp of American manufacture. It is rated at 20 volts—12½ amperes—and, when used with a transformer, may be operated at 115 volts. A 25 per cent increase in illumination is possible over any other type lamp of similar wattage. The nature of the light source has been shown by Naumann to influence greatly the contrast of the projected picture. Mirror arc lamps were shown usually to be less contrasty than arc lamps using condensers. Patent protection has been granted for a projector illuminating system which serves two projectors.

### Fire Protection

Nuckolls has published valuable data on ignition temperatures of nitrate and acetate films, the type of decomposition, and the products of combustion. A number of patents have appeared describing various means of closing projection room ports, disconnecting electrical circuits, directing currents of air on the film, and using fire screens.

### Special Projection Equipment

*Effect Projection and Stage Shows.*—Methods of using wide-angle lenses to project a much enlarged picture on the screen have been employed in several of the large theaters for certain scenes of such pictures as *Old Ironsides*, *Trail of Ninety-Eight*, *The Hollywood Review*, and *Hell's Angels*. In one process, a movable screen was utilized which traveled downstage as the growth of the picture occurred. These methods all tend to over-accentuate the graininess of the picture. The same defect holds if too large a picture is attempted with wide film, tests having shown that a width of 50 feet is the maximum permissible before such effects begin to appear.

An expanding screen developed by an English firm is claimed to be particularly effective for emphasizing the climax of a picture. When space is

at a premium back stage, the public address system with outlets over the proscenium arch, has been utilized quite successfully as a substitute for the usual horns during presentation of shorts, such as song cartoons.

A new model of effect projector incorporates as features a pre-set adjustment for effects or slides, and a lens assembly of 10 to 32 inch focus mounted so as to permit rapid change to any one side.

One of the most successful artifices adopted for imparting a stereoscopic effect to motion pictures is to move the camera while the optical axis is made to pass through a central point of interest in space. DeLassus has announced a device by which the optical axis is directed automatically, whatever the displacement of the camera. Ives has given his analysis of a method of stereoscopic photography invented by Bessiere. It uses a large lens, greater in diameter than the interpupillary distance. It is claimed that the relief cannot be exaggerated by this method. Three patents dealing with stereoscopic motion pictures have been published; two of them are concerned with the preparation of two films with pairs of images; the third with a projection device.

### Non-intermittent Projection

The Holman continuous projector was demonstrated at the Washington meeting of this Society and a paper describing its operation was presented. The mechanism consists chiefly of a pair of lens wheels rotating in opposite directions. These act as the two intermediate elements of the projection lens when driven at the proper speed. Apparatus for manufacturing the lens wheels has also been described. The well-known Mechau projector has been fitted with sound reproduction attachments.

A novel portable non-intermittent projector for educational use has been made available by Gaumont. It consists of a folding metal case hinged at the top. When opened the take-off reel is located in the top. Film moves continuously around a hollow sprocket containing a stationary prism. Light from a source on the front of the projector is directed toward the rear through a condenser system and then through the film, where it strikes the first prism. At this point, it is reflected onto the second prism and thence through the rotating lens drum, and is directed finally through a suitable lens system onto the screen.

Thun has presented an optical and

## GRIFFIN FILM CEMENT

Makes a non-buckling patch that stays stuck

Specialty Suited for Sound Prints  
Manufactured by

**F. B. GRIFFIN, - - - Oshkosh, Wis.**

FREE SAMPLE and PRICES on request



mathematical analysis of the errors encountered in motion picture projectors utilizing the principle of optical compensation. Only a few patents have appeared disclosing improvements in methods of obtaining non-intermittent projection.

#### Much Work in Acoustics

Lindahl and Waterfall have reported on extensive tests made by acoustical engineers in redesigning theaters. They regret that more opportunity is not given this group of engineers in planning new theater acoustics. Chrysler and Snyder reported on sound absorption measurements in a room where persons dressed in different types of clothing were seated in various kinds of chairs. The values ranged from 2.3 to 4.8 at 512 cycles depending on whether or not coats were worn. Audience absorption is one of the most important factors in determining reverberation times in a theater. Eyring has shown that an auditorium, to have a single optimum reverberation time, should not only be free from echoes and have the proper amount of damping, but the absorbing material should be fairly uniformly distributed, resonating bodies eliminated, and a condition for diffusing sound should be assured. A time bridge for measuring reverberation times in enclosed spaces has been designed by Olson and Kreuger. MacNair has suggested that the rate of decay of loudness sensation is a better criterion for the arrangement of damping material in auditoriums than decay rate of sound energy. A more general equation for determining optimum absorption of any size room than the formula of Sabine has been developed.

The results of measurement of sound transmission by various types of wall insulation materials have been reported by Sabine. Maximum intelligibility of speech occurs at a level above 70 decibels above the noise level according to Knudsen, and for good results should not fall below 50 decibels. The reverberation time for speech is noticeably different from that for good reproduction of music.

#### Telephotography and Television

Developments in television have progressed rapidly during this year both in this country and abroad. From an examination of trade publications and technical journals, it is evident that the interest in this newest method of picture transmission is world-wide and acute. An International Institute of Television was founded in Brussels, Belgium, which will deal with results of researches in connection with the broadcasting of pictures. Eighteen companies were reported to have twenty-two stations in operation in the United States for television experimentation. No license is granted by the Federal Radio Commission, however, unless evidence can be shown that the work represents legitimate research.

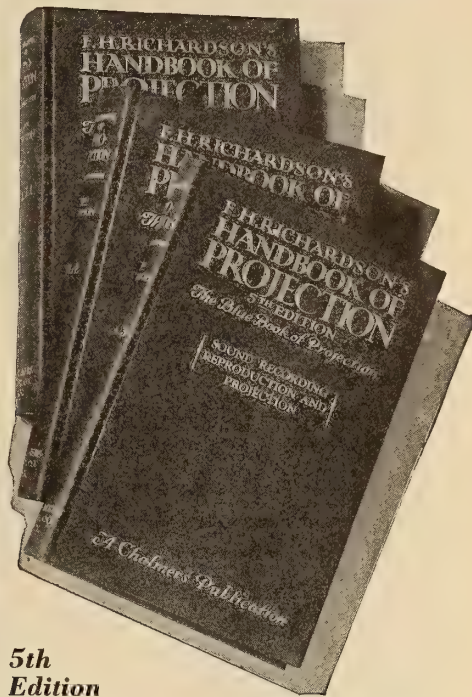
A three-day test, made in September to transmit televised signals across the Atlantic ocean, failed and was abandoned. The German expert, Karolus, was in charge of the experiment and was assisted by members of the staff of RCA and the General Electric Company. A permanent equipment installation for two-way television was set up in April between the Bell Laboratories and the American Telephone and Telegraph Company's offices, which are about two miles apart. Speakers face a screen and talk into a microphone just back of it so the entire face is visible for scanning. The loud speaker is placed carefully to avoid reaction with the microphone in each booth. A 5,000 element picture is transmitted requiring a transmission band 40,000 cycles wide.

Television images transmitted by radio were shown as a part of the regular performance at the Proctor Theater, Schenectady, N. Y., on May 22nd. A loud speaker system was used to transmit the voices of the actors who performed before a "television camera" at the General Electric plant, about one mile distant. A 48-hole scanning disk covered the subject twenty times per second. Four photo-electric tubes responded 40,000 times per second to the impulses reflected back from the subject. The images were transmitted on a wavelength of 140 meters; the voices on 92 meters. At the theater, the light impulses were reproduced first on a small monitor "Teloptikon," then transferred to a light valve where the light was broken up by a 48-hole scanning disk to reproduce the images which were projected on a screen six feet square set under the proscenium arch. Heads and shoulders of the subjects were reproduced in a black and white picture showing gradation of tones. The system was developed under the direction of Alexanderson. Richardson has published a detailed description of the optical system used in the Alexanderson television projector.

#### Good Progress in England

Marked progress has also been made in England in the development of tele-

## THE BEST SELLER



5th  
Edition

## HANDBOOK OF PROJECTION

By F. H. Richardson

Back in 1910 Mr. Richardson wrote the first Handbook of Projection. It was a sell out. Second, third and fourth editions, each bigger and more successful have followed. The present fifth edition in three separate volumes, illustrated above, is the culmination of years of intensive effort.

Richardson is no swivel chair author. He knows the problems of the field—meets the men on their own ground. His books reflect a practical knowledge of just what information is needed. Recently he completed a 17,000 mile trip through the U. S. and Canada in the interests of projection.

#### CONTENTS

Volumes I and II are devoted entirely to the general subject of projection and everything related to it. Volume III deals exclusively with sound projection. All three volumes are profusely illustrated and contain over 1,400 pages of projection information written so you can understand it clearly. Each volume contains Richardson's famous question and answer index giving immediate access to hundreds of different problems.

These are the books which are being used by projectionists and theatre managers all over the world to secure improved results. Send for this finest of projection libraries today.

#### USE COUPON TO ORDER

CHALMERS PUB. CO. (M)  
516 Fifth Avenue, New York, N. Y.

Enclosed find (check) (money order) for \$10.25. Send Richardson's 3 volume Handbook of Projection to .....

#### WINNIPEG, CANADA

J. M. RICE & CO., J. M. Rice, Prop. Leading equipment dealers in all kinds of projection room equipment facilities. Representatives of leading equipment manufacturers of the United States and Canada. All our merchandise guaranteed for performance and stability. Whatever you want, we will supply it.

## THE BIOSCOPE

The Leading Journal of the British  
Cinematograph Industry

20th Year of Weekly Publication

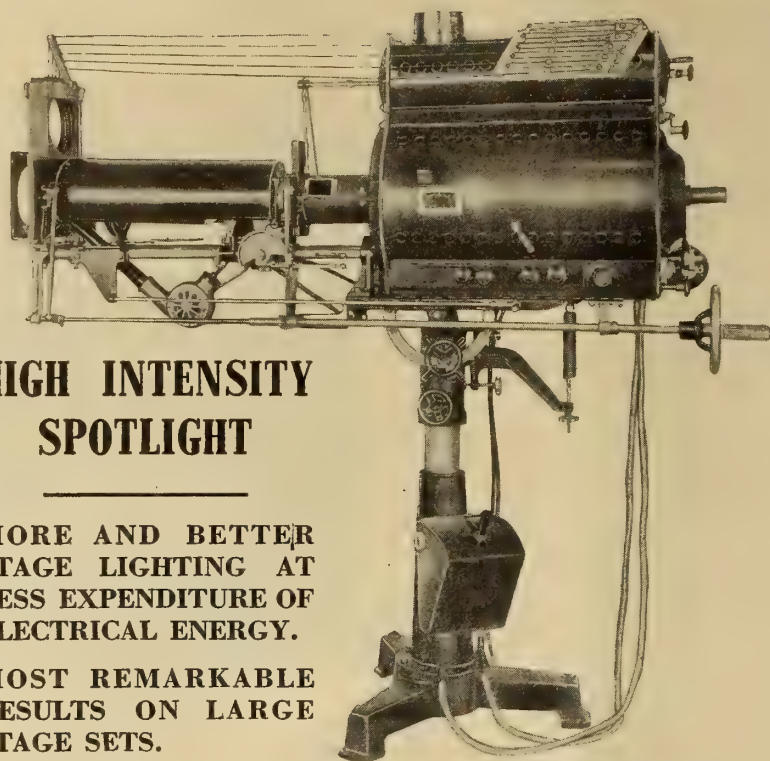
Contains a complete section each week  
for the special benefit of Projectionists.

Cash prizes awarded for original ideas  
published. Specimen copies 18 cents.

Annual Subscription 7 dollars 50

THE BIOSCOPE PUBLISHING CO., Ltd.  
8-10 Charing Cross Road, London, W. C. Eng.





## HIGH INTENSITY SPOTLIGHT

**MORE AND BETTER  
STAGE LIGHTING AT  
LESS EXPENDITURE OF  
ELECTRICAL ENERGY.**

**MOST REMARKABLE  
RESULTS ON LARGE  
STAGE SETS.**

**HALL & CONNOLLY, INC.**

24 Vandam St.

New York, N. Y.



vision in the hands of Baird Television, Ltd. Experimental transmissions were initiated in conjunction with the British Broadcasting Corporation from Brookman's Park broadcasting station on Sept. 30, 1929. Simultaneous sound and vision transmissions were begun on March 31, 1930, sight being transmitted on a wave-length of 261.3 meters; sound on 356.3 meters. A play was televised July 14, 1930. On July 1, 1930, a demonstration of television was made before press representatives on a 3 by 6 foot screen. Screen brightness was insured by using 2,100 ordinary metal filament lamps instead of neon tubes and Kerr cells as in earlier experiments. Commutator contact switches, turning on one lamp at a time, sweep the entire bank of 2,100 lamps in one-twelfth of a second. The receiving outfit on a portable truck was installed in the London Coliseum and demonstrated as a part of their regular variety program three times daily from July 28 to Aug. 9, 1930. A talking film made on Friday, Aug. 8th, was televised as a special feature of the program on the closing date of Aug. 9th. The Baird Company also markets a commercial television outfit for home use, ready for attachment to any good radio set.

Replogle has described the problems encountered by the Jenkins Television Corporation in establishing their regular broadcasting presentations. A special disk scanning system is used with a mercury vapor lamp for illumination. In another television system, patented by Lieut. Wold of the Quartermaster Corps, U. S. Army, mechanical scanning is said to be rendered unnecessary by the use of a lamp house having a lattice work of filaments, different junctions of which become luminous successively. A means of keeping the receiving televisior in synchronization with the transmitting device has been described consisting of a phonic motor designed to operate on the strong 720-cycle scanning frequency component.

### Special Problems

Schroter has presented data on reproduction and amplification in television work and Rhein has treated the difficulties associated with the televising of motion pictures.

According to one patent specification, pictures to be transmitted by television are recorded on a film which is both light sensitive and fluorescent. This film is processed as usual and then passed between a cathode ray tube and a light sensitive cell. At the receiving station, the signals influence a pencil of cathode rays which oscillates in two dimensions to reproduce a picture on a fluorescent screen, or in one dimension so that the emergent rays affect a photographic film. Another patent

**A HAPPY  
and  
PROSPEROUS  
NEW YEAR  
to our many friends  
throughout the  
world**

**MOTION PICTURE PROJECTIONIST**

45 West 45th Street

New York City



protects a method of recording telegraphic impulses.

#### Color Cinematography

According to plans announced during the summer of 1930, positive prints made by the additive Herauld Trichrome process have the three successive frames dye tinted. Projection is made with a Continsouza-Combes non-intermittent projector which at 24 frames per second is said to suppress flicker. This projector does not use mirrors or prisms, only spherical lenses. The Wolf-Heide process is said to use a similar projection method.

A color process using a three color mosaic screen has been developed by the Danish inventor, Larsen. The color intensity of the particles can be increased after exposure and prior to projection. The Horst system of additive color cinematography utilizes a prism system in the camera so arranged that three pictures may be exposed simultaneously through primary filters. In the positive each frame carries three images, each corresponding to one of the color separation images of the negative. No details of the method of projection are included. Baker has published a series of articles dealing with systems of color photography.

Patents issued on three color additive processes disclose among others, methods for making multicolor screen mosaic films, shutters for color cameras, optical projectors, the use of tri-pack films, and projection in a special sequence of tri-color records. Only one patent was noted describing a color process using embossed film.

A new two-color additive process is reported to have been used in making *The School for Scandal*, shown during the early part of October, 1930, at the Plaza Theater, London. A few patents relating to improvements in two-color additive processes have been issued.

Subtractive color film processes continue to enjoy the greatest commercial application, although quite a few poor quality color prints were released during the past year when the demands of the producers for color became so great that it was difficult to supply enough color prints to satisfy the orders. Several of the leading color motion picture firms have kept their standards high, however, and productions released late in the summer of 1930 were of much improved quality.

Sound prints by the Technicolor process have been released commercially with a silver image sound track having a contrast or gamma of unity, having been printed from a negative having a similar contrast or gamma of unity. This procedure was that originally recommended for handling variable density sound track, but a compromise was necessary generally in connection with black-and-white picture technic, which is unnecessary in color prints by this proc-

## CINEPHOR » » LENSES « «



NOTED FOR  
FLATNESS  
OF FIELD

THE rigid tests to which Cinephor Lenses are subjected before leaving the B & L factory are your guarantee of the highest quality Projection Lenses.

The test for Flatness of Field—illustrated above—is based on comparison of different areas of the lenses. This assures you of that absolute uniformity so necessary for perfect projection.

All Cinephor Lenses are so critically tested and so uniformly dependable that the purchaser finds it unnecessary to make any selection for quality.

BAUSCH & LOMB OPTICAL CO.

680 St. Paul St. « » Rochester, N. Y.

Makers of Orthogon Eyeglass Lenses for Better Vision



# BAUSCH & LOMB

## Your Preference, Please!

THE editors of THE MOTION PICTURE PROJECTIONIST solicit your aid to the end that this publication may be of the maximum service to you. Every subscriber can do his bit to improve this service by using the space provided below to indicate his preference for special articles and other material in which he may be particularly interested.

Let us know your preference, please. All requests will receive attention in the order of their receipt, so act quickly. Use the blank below to tell us in just what subject you are particularly interested. Do it now!

Editor,  
M. P. PROJECTIONIST:

I am interested in the following subjects, on which I should like to see information in THE MOTION PICTURE PROJECTIONIST:

1. ....
2. ....
3. ....
4. ....

NAME .....

ADDRESS .....



# THE ROSS

F:2-4 PROJECTION LENS

SOLE DISTRIBUTORS:—  
IN U. S. A.

**THE NATIONAL THEATRE SUPPLY CO.**

(Branches in All Large Cities)

IN CANADA:

**INSTRUMENTS, Ltd.**

OTTAWA



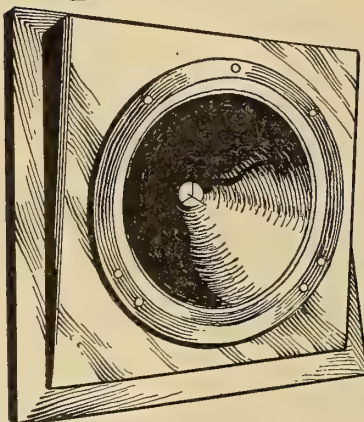
TORONTO

*A Big Special—While They Last*

## \$110.00 PHOTOPHONE SPEAKERS



12-inch  
Dynamic



Brand New  
in original  
cases  
Limited Quantity  
Order today

\$15

Never before was such an astounding value offered. Every carnival owner, motion picture house, theatre, church, fair, American Legion Post, club, sound engineers and radio experimenters will want one.

12-inch Dynamic Field Supply; 110 volts D. C.; Field Resistance, 1000 Ohms; Voice Coil, 8 Ohms; Mountings, Steel angle frame. For adaptation to A. C. operations, \$6.50 additional.

Terms: 25% with order; balance  
C. O. D. or Sight Draft.

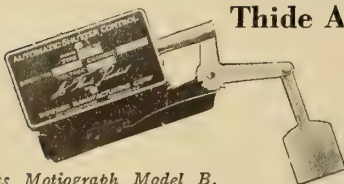
Specify Express or Freight

**M. & H. Sporting  
Goods Co.**

512 Market St., Philadelphia

### DEPENDABLE PROJECTION--CONTINUOUS SHOWS

#### Thide AUTOMATIC SHUTTER CONTROL with 3-wire circuit foot switch



Fits Motiograph Model B, Simplex and Super-Simplex, and Sure-Fit. With or without Rear Shutter Mounts.

Rear Shutter Mounts require Model D type. Your Model A Change-over replaced with Model D type. Liberal allowance for Model A.

#### The Standard Changeover

Simple for mounting and replacements; every part machine tooled and precision assembled. Special wound coils for D.C. any voltage and for A.C. any voltage and frequency. 3-wire circuit foot switch allows synchronization of all projectors with effect machine.

**DOWSER**

691 LINCOLN PL. MANUFACTURING CORP. BROOKLYN N.Y.

ess. The advantages of the original method are said to be greater ease of control, and somewhat greater latitude in volume control. The feature picture *Whoopee* is the first to make use of this improved procedure.

A new plant for the Multicolor process, being constructed in Hollywood during the summer and fall of 1930, will require 200 men and will have a capacity of 3,000,000 feet of film per week. A school for color cameramen is being conducted. A comedy short in color by the Sennett color process was shown at a Broadway theater in October, in which underwater photography was reported as being quite natural. The negatives are made by running two films through the camera simultaneously, the upper film acting as a filter for the lower. Prints are on double coated stock and are toned with inorganic salts.

A description has appeared of the Photocolor laboratory and of its process. Two negatives are made with a twin-lens camera and dye toned prints on double coated film. A well-known German optical firm was reported to be supplying projection lenses of wider diameter for use with mirror arc projectors for color motion picture projection.

Patent disclosures on subtractive processes describe printing machines for making two color prints on double coated film, the compounding of color images by dye toning and metal toning methods, and the making of three color film records, by printing on opposite sides of one-half of a double width, double coated film, and on one side of the other half and folding the film lengthwise.

#### Standards Report

The proposed revisions of the glossary include the dropping of certain terms that have become obsolete or that have become part of the English language and are to be found in any good dictionary. They include also the correction of definitions that were in the old glossary and the addition of many more terms that have come into use since this glossary was published. The subcommittee has in its possession a list of definitions prepared by the Academy of Motion Picture Arts and Sciences, which has been of considerable assistance to the committee.

Work has been continued on the compilation of a list of foreign equivalents of the terms defined in the glossary. This has not advanced far enough, however, for publication and it is recommended that the work be continued by the succeeding committee.

A subcommittee, consisting of Messrs. Farnham, Hubbard, Mitchell, and Rackett (*Chairman*) has met during the summer to formulate cer-



tain recommendations which are presented below for consideration by the Society. The policy of the subcommittee has been to sponsor only those practices which have not only all the features that qualify them as practical working specifications but have as well the support of at least a majority of those who use them.

(1) *Projector Speed.*—It is recommended that a nominal projection and reproducing speed of 90 ft. per minute be adopted for all 35 mm. films. This replaces Item 8 and Item 15 of the current recommended practice.

(2) *Camera Speed.*—It is recommended that a nominal photographing and recording speed of 90 ft. per minute be adopted for 35 mm. films. This replaces Item 9 and Item 14 of the current recommended practice.

(3) *Standard Leaders for 35 Mm. Release Prints.*—This committee has been in close touch, through interlocking memberships, with the work of the Technician's Branch of the Academy of Motion Picture Arts and Sciences. We are very pleased to recommend the adoption by this Society of the Academy's specifications for standard leaders to be used with 35 mm. motion picture release prints. The detailed plan of release prints is given below. It is felt by this committee that the general adoption of these recommendations will avoid much of the mutilation of release prints that is now current.

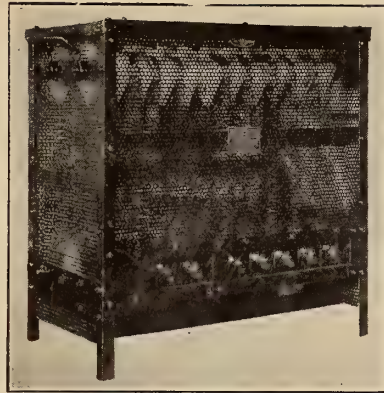
(4) *Screen Brightness.*—The subcommittee has under consideration the formulation of limits for screen brightness and is seeking to arrange for a co-operative effort with the Academy of Motion Picture Arts and Sciences for the ultimate standardization of this important factor in motion picture projection.

(5) *Screen Color.*—With the increasing use of color films, the standardization of screen color is as important as the standardization of screen brightness. Due to the difference in spectral quality of incandescent lamps, low intensity and high intensity arcs, the color of the projection light varies from a yellowish-white to blue. In addition, projection screens vary considerably in their color. Under existing conditions, it is impossible to realize the full value of color prints. The subcommittee will undertake a number of co-operative investigations in an effort to improve this situation.

(6) *Theatre Sound Intensity.*—One of the most important factors in the presentation of talking motion pictures is the level of the sound intensity in the theatre. It is obviously bad practice to delegate the regulation of sound intensity in a theatre to one person because his individual preference may not be in accord with general public approval. Also, this individual is often located of necessity at a point where his observations are of little value. For these reasons, the committee feels that the establish-

# Hoffmann-Soons

## PERFECTION



Making claims is one thing—Standing back of them is another.

Projectionists and theatre owners who have installed Perfection Rheostats know our guarantee means the best results—clearer pictures and longer life.

And Union-made workmanship of highest skill—the only rheostats so made—is an added guarantee.

New Type adjustable solderless lugs taking from No. 4 to 4/0 wires now furnished on all rheostats at no extra cost.

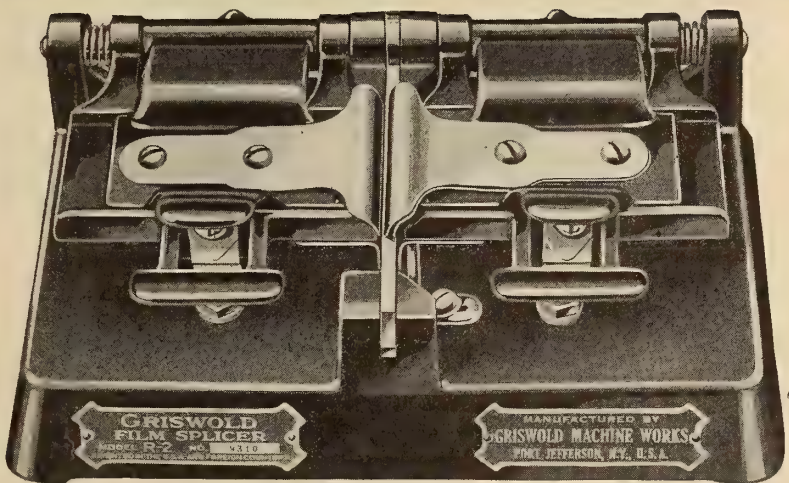
Sold by all branches of the National Theatre Supply Co., Sam Kaplan, New York, and by your dealer.

**HOFFMANN-SOONS**  
ELECTRICAL AND ENGINEERING CORPORATION

387 First Avenue Mfg. Division New York

Contracting Electrical Engineers—Moving Picture  
Theatre Electrical Specialists

# RHEOSTATS



15,000 Griswold Film Splicers are in constant use daily in theatres throughout the World. The standard film splicer for efficiency, durability and economy.

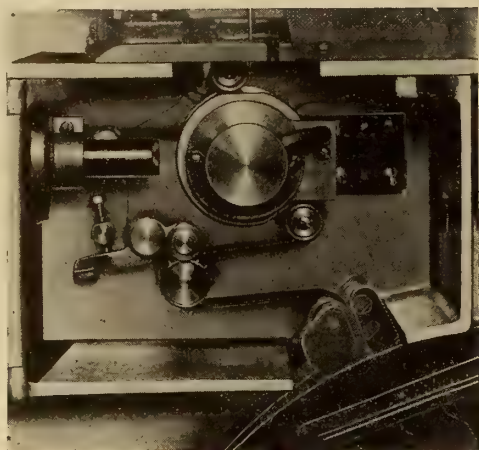
**GRISWOLD MACHINE WORKS**

Port Jefferson, L. I.

New York



# SYNCHROFILM



Sound Head for Simplex

Smooth Steady Drive. Easy to Install. Can Be Fitted to Your Present Disc Equipment. Low in Cost. Models for Powers, Simplex, and Motiograph Projectors.

## WEBER MACHINE CORP.

59 RUTTER ST.

ROCHESTER, NEW YORK

Export Department  
15 Laight St., N. Y. C.

Cable Address  
"ARLAB" New York

### High Points of SYNCHROFILM

No Friction on Film  
—Rolling Contact  
Throughout

No Possible Injury to  
Film

Patented Optical System  
Delivers Light Beam  
One-Half Thousandth  
of One Inch Wide of  
High Intensity

All Rollers Ball Bearing.  
All Parts Chromium and  
Cadmium Plated.

ment of an optimum sound level, preferably with mechanical means for its indication, is highly desirable. The Projection Committee of the S.M.P.E. has this problem under consideration and it is hoped that a standardization of practice may be brought about through cooperation both with this committee and with other organizations.

#### Wide Film Dimensions

This committee has felt that the standardization of wide film dimensions was the problem of prime importance before it, and the subject has been considered at great length at three meetings of the entire committee and at seven meetings of a subcommittee consisting of Messrs. Davee, DeForest, Evans, Griffin, LaPorte, Spence, Sponable, and Batsel (*Chairman*).

It is quite generally agreed that placing the sound track on the present 35 mm. film results in a picture with undesirable proportions. When these proportions are corrected by masking the height, the smaller area of picture requires a greater magnification of the film to cover the same size of screen. As the magnification has already been pushed close to the limit set by the graininess of the film and its unsteadiness in the projector, the utilization of a portion of the film for the sound track has made the projection of pictures of even moderate screen dimensions not altogether satisfactory. Simultaneous with the general introduction of sound has come a desire on the part of the industry for a larger projected picture that would include more action. Although several methods have been suggested for the realization of large screen pictures with the present 35 mm. film, this committee feels that none of these methods offers a permanent solution to the problem and that, at the present time, the only satisfactory method of obtaining a large screen picture seems to be through the use of a wider film.

#### Advantages of Wide Film

There are many obvious advantages to wide film. It not only permits a sound track of more satisfactory width than in use at present, but it makes possible large screen pictures having a greater variety of composition and more action without exceeding a practical limit of magnification. In considering a new standard for motion picture film, this committee has been guided not alone by engineering principles but by considerations of the cost to the industry of a new standard and of the necessary transition period. It is obvious that any practical recommendation must involve the ratio of screen width to screen height that is already established within reasonably narrow limits by both the proscenium arch and the balcony cut-off in existing theaters. An investigation of this sub-



### THAT TRIP TO CHICAGO

will be made more enjoyable if you stop at the New Bismarck. A leader in all the improvements and luxuries that contribute to comfort, this hostelry enjoys a nation-wide reputation for good food and superior service.

Quiet rooms, restful beds, reasonable rates, and easy accessibility to all business and social points.

Write for booklet with downtown map

Rooms, \$2.50 Up—With Bath, \$3.50 Up.

NEW  
**BISMARCK**  
HOTEL CHICAGO

RANDOLPH AT LA SALLE





ject shows that, whereas a few of the larger theaters can use a ratio of width to height as great as 2 to 1, the ratio for the smaller theaters is usually less. After careful consideration of this subject, this committee recommends the adoption of a 1.8 to 1 ratio of width to height as the best compromise. This ratio seems to be not out of line with prevailing sentiment among members of the Academy.

During the deliberations of the subcommittee, it became increasingly evident that the adoption of release prints with a width in the neighborhood of 65 or 70 mm. would be economically impracticable for a large proportion of theaters. It seemed desirable, therefore, to give consideration to a film size intermediate between these dimensions and the present 35 mm. standard. We are working on a layout that will permit the use of the 1.8 to 1 ratio and that will provide for a wider sound track and more suitable margins. We are attempting to assign dimensions to this film that will permit the most economic use of existing 35 mm. equipment.

While the specification of the release print dimensions is the problem of most importance, this committee has under consideration a negative of such proportions that it can be printed by optical reduction on the new intermediate film size or by contact on a larger film for the *de luxe* houses.

### Basis of Effect Secured With Vacuum Tubes

THE heart of sound reproducing apparatus is the vacuum tube. This marvel of science has made possible modern radio broadcasting, long distance telephony and sound pictures. New uses are found for it every day. It is not difficult to learn how it works, and to understand why it works is to know some interesting phases of electrical theory. Such explanation will necessarily involve the principles of amplifying apparatus in which we are primarily interested.

The ordinary vacuum tube—triode, valve, audion, as it is variously known—consists of an evacuated glass bulb containing three elements:—a filament, a grid, and a plate. The filament is heated by an electric current and emits electrons. These electrons pass to the plate through the grid. The potential variations on the grid control the number of electrons passing between the filament and the plate.

#### The Electron Theory

The basis of explanation is the electron theory and it is desirable to go into this at some length before returning to a consideration of the vacuum tube. According to this theory, all matter is fundamentally composed of electric charges, that is, everything that we know existing as liquid solid, or gas is basically made up of one thing. Different kinds of

matter differ in that they contain varying amounts of this one thing.

Matter may be chemically classified into various "elements"; in other words, a substance may be divided into its constituents and these parts broken up still further into their components until there remain substances that cannot be subdivided. No one of these final substances may resemble the original. As a simple example:—water we know to be composed of hydrogen and oxygen. Passing an electric current through water will cause it to break up into these two parts. Oxygen and hydrogen normally are gases and in no way resemble water. No matter what further operations may be applied to either of these we cannot subdivide them into different substances. Such substances

we call "elements," of which the more common ones are copper, iron, zinc, and lead. The smallest part of these elements that is distinct as part of the element we call the *atom*.

#### Composition of the Atom

It has been established that every atom of matter is charged with minute particles of electricity, or *electrons*. The word "electron" is used to denote the smallest unit of electricity. We may for the sake of convenience picture it as a very small particle that carries a definite charge of electricity. We have come to apply the term to a very small particle of electricity that is "negative." Opposed to it is the "positive" electron, which is of equal value and which some now call *proton*. Both are



## SUPER-LITE LENSES

WISELY CHOSEN BY  
AMERICA'S BEST THEATRES

NEW BIFOCAL SUPER-LITE  
LENS F:2.0

A variable focus lens with a wide range of foci for both silent and sound film.

SERIES III. SUPER-LITE  
LENS F:2.0

Standard full Half-Size lens furnished in short focus as low as 4" E. F. and up to 10" E. F.

SERIES IV. SUPER-LITE  
LENS F:2.0

Full 3" diameter lens to meet the demand for more light for longer throws. 6" E. F. to 10" E. F.

Quality Guaranteed

PROJECTION OPTICS CO., INC.

330 Lyell Avenue

ROCHESTER, N. Y.

U. S. A.

Give This to Your Friend—Have Him Fill It in and Mail to us at Once

The Motion Picture Projectionist

45 West 45th Street, New York City

Gentlemen:

Enclosed please find \$2.00 for which enter my subscription for one year (12 issues) starting with .....issue. (Two years, \$3.00.)

Name .....

Street .....City .....

State .....Local No. ....



charges of electricity, and it is because of certain characteristics peculiar to each and their marked behavior to each other and to themselves that we distinguish one as positive and the other as negative.

The law that these charges always follow is that like charges repel each other and unlike charges attract each other. Two electrons therefore, will not remain in each other's company; while a proton and an electron will be attracted to each other. An electron, when separated from the atom to which it is attached, shows none of the properties of ordinary matter. It does not react chemically with other electrons to produce new substances, even though the elements from which they come may do so. An electron from the hydrogen atom is exactly similar to that from an atom of copper or zinc or tin, or any other substance.

Within the atom is a positive charge of electricity in the form of a nucleus, and close to it, in accordance with the fundamental law of unlike charges attracting each other, is an electron or a number of electrons, depending upon the atom of the particular element being considered. As previously stated, the difference between the elements lies in the number of charges in their atoms. Hydrogen, for example, has but one electron about its nucleus; copper has twenty-nine. Some substances have positive nuclei that will hold more electrons.

Under normal conditions the atom has just enough electrons or negative bits of electricity to satisfy the positive nucleus. However, if something should happen to the atom and one electron be removed, conditions would no longer be normal—the atom has a positive charge that is unsatisfied and the whole atom is therefore considered positively charged. Similarly if by one means or another an extra electron were introduced into the atom there would be an unsatisfied negative charge and the atom would be considered negative.

Under either of these conditions the atom has a new name: it is called an *ion*, and the process of adding or subtracting an electron is called *ionization*. In the filament of a vacuum tube we are continually removing electrons by the application of heat.

By conductivity is meant the ability of a substance to pass an electric current. In conducting solids there exist atomic systems in which the number of electrons, free or easily freed by the application of a potential, such as a battery, is comparatively large. These electrons we call free electrons, and while they may be relatively free from an atom, they cannot fly off from the substance itself, which is the condition that we want to secure in a vacuum tube. The force that holds the electron in the substance will be discussed later. The substances that do not have free or easily freed electrons are known as *insulators*.

## Definitions of Common Terms

Definitions of common terms used in amplifier work is as follows:

**"A" Battery**, or filament supply: The battery or generator or transformer used to supply the voltage and current to light the filaments of the vacuum tubes. It is independent for its values upon the type of tube used. The current that flows in the filament of the vacuum tube is known as the filament current, or "A" current.

**"B" Supply**, or plate battery: The battery applied to the plate of the tube is known as the "B" battery and may be supplied by batteries, a generator, or power pack. The current that flows between the plate and filament is known as the space current or plate current or current in the plate circuit.

**"C" Battery**: The battery in the grid circuit of the tube is known as the "C" battery and is usually supplied by a battery but is sometimes supplied from a power pack. The emission of electrons by the heated coating of the filament is known as the emission of the tube and should be standard within permissible limits for all tubes of the same type.

It would be well to remember the above definitions so that you will be familiar with the terms commonly employed in all amplifier work.

## Where the Light Goes

Sound pictures require screens permeable to sound. The most efficient of this type do not reflect more than 60 per cent of the incident light rays. They have, therefore, placed a demand upon the projector for an increase of 30 to 50 per cent more light than that required by the solid screen. With the coming of the colored film, the call for more light will be insistent. In this case, the loss of light is felt at the source. The color in the film absorbs 20 to 40 per cent of the light thrown upon it by the condenser and, when the color films are combined with sound and talking effects, and projected from the front, the light will have to be greatly increased or the value of the picture diminished to that of the old lithographed pictures of the magic lantern days—pictures that were as flat as the screen.

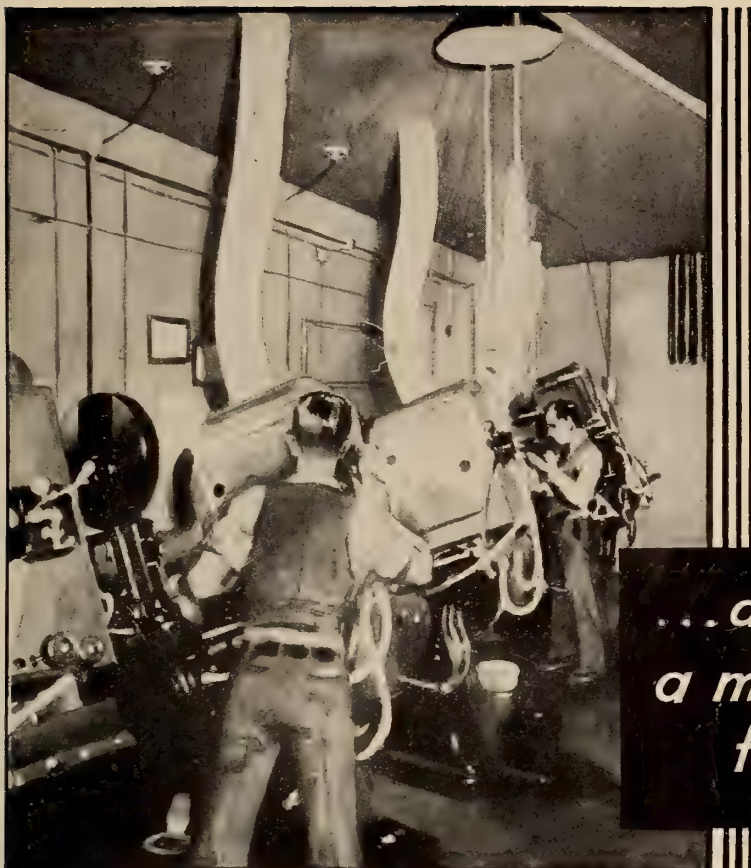
## Higher Amperages Due

When we consider that all this light has to be generated in the crater of the art, we are not surprised at the continued growth of the current consumption. Amperages of 12 grew to 18; this rose to 24, to 36; now an arc taking 80 amps. is quite common and in the near future we may expect to see this exceeded, and 150 or 250 amps. for a colored talking film may possibly be necessary. This will probably entail entirely new wiring in most theatres probably new generating plants in many.

## Index of Advertisers

Ashcraft Auto Arc Co.....	39
Bausch & Lomb Opt. Co.....	45
Best Devices Co.....	5
Bioscope, The .....	43
Bismarck Hotel, The.....	48
Blue Seal Products Co.....	41
Brenkert Lt. Projec. Co.....	6
Canadian Theatre Supply Co.....	37
Chalmers Publishing Co.....	43
Dowser Mfg. Co.....	46
Eastman Kodak Co.....	37
Enterprise Optical Mfg. Co.....	Cover
Fish-Schurman Corp. ....	39
Forest Electric Corp.....	42
Fulton, E. E., Co.....	4
General Machine Co.....	36
Golde Mfg. Co.....	40
Griffin Manufacturing Co.....	42
Griswold Machine Works.....	47
Hall & Connolly, Inc.....	44
Hertner Electric Co.....	5
Hoffman & Soons, Inc.....	47
Ilex Optical Co.....	Cover
Instruments, Ltd. ....	46
International Projector Corp.....	7
Kaplan, Sam, Mfg. & Supp. Co....	2
M. & H. Sporting Goods Co.....	46
Movie Supply Co.....	40
National Carbon Co. ....	3
National Theatre Supply Co.....	51
Projection Optics Co.....	49
Rice, J. M., & Co.....	43
Roth Bros. & Co.....	8
Strong Electric Corp.....	36
Theatre Engineering Service.....	38
Weber Machine Corp.....	48
Weston Elec. Inst. Corp.....	6





*...and then  
a mechanism  
froze...*

## ...BUT ON WENT THE SHOW!

Emergencies are poor things to wait for. You can avoid them by asking your National Representative to make a periodic check-up on your projection equipment. If repair work or overhauling is needed the National Repair Department will take care of it for you. Factory methods. Genuine repair parts. Equipment to replace your own while the work is being done. Moderate charges. Ask at your nearest National Branch for further details.



This stamp of approval is your guarantee of manufacturers' quality. Look for it in theatre equipment advertisements.

**NATIONAL THEATRE  
SUPPLY COMPANY**  
*Branches in all Principal Cities*

Friday night at the LYRIC... The feature was on, everything running smoothly as usual. Then, a mechanism froze... There wasn't a very large crowd—that show didn't mean so much. But the next day, Saturday, is a weekly box office picnic at the Lyric. The matinee gets good attendance and the two evening shows pack 'em in... Yes, there was negligence involved—there usually is. The complete overhauling of projectors had been recommended some weeks before but it's human nature to put things off... And now in a jam—what?... There was a hurried phone call to a National Branch. For half an hour one projector did the work of two. Then a National Repair Expert was in the booth and on went the show! No loss of patronage. No cut in Saturday profits... That's the sort of rush repair service National has made available to every American exhibitor. A phone call to your nearest National Branch will get results—as quickly as it's humanly possible to get them; as reliably as the skill of Expert Projection Repair men can make them.



# MOTIOGRAPH DE LUXE SOUND FILM PROJECTOR

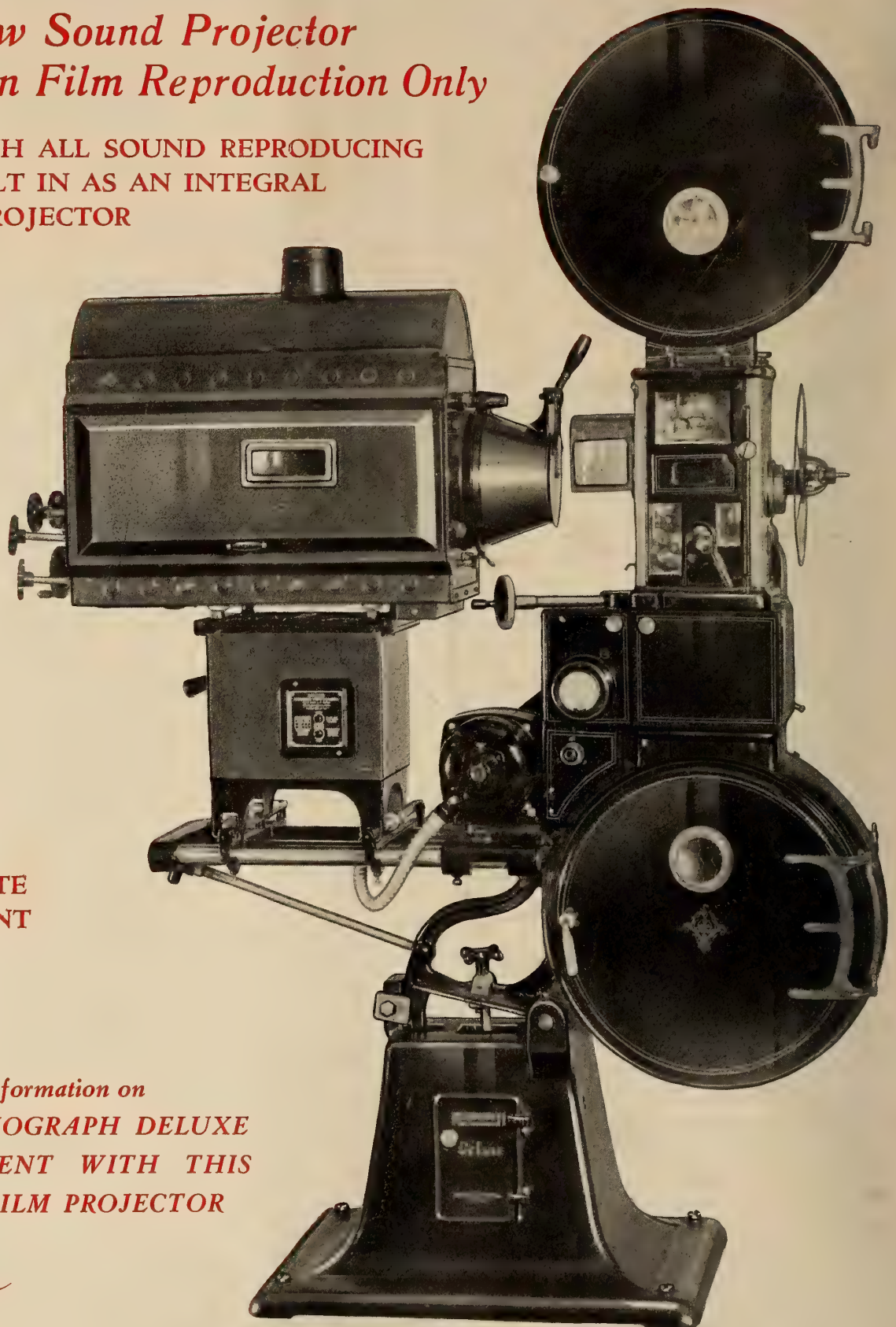
*A New Sound Projector  
For Sound on Film Reproduction Only*

UNIT BUILT WITH ALL SOUND REPRODUCING  
EQUIPMENT BUILT IN AS AN INTEGRAL  
PART OF THE PROJECTOR

STRONG,  
STURDY,  
DESIGNED  
MECHANICALLY  
RIGHT FOR  
YEARS OF  
EFFICIENT  
SERVICE.

MATCHED,  
UNIT-BUILT FOR  
MOTIOGRAPH  
DELUXE COMPLETE  
SOUND EQUIPMENT

*Write for information on*  
COMPLETE MOTIOGRAPH DELUXE  
SOUND EQUIPMENT WITH THIS  
NEW SOUND FILM PROJECTOR



THE ENTERPRISE OPTICAL MFG. CO., 564 W. Randolph St., Chicago, Ill.



# MOTION PICTURE PROJECTIONIST

(Fourth Year of Publication)

ILEX F:2.5

DUAL FOCUS

**T**RULY a remarkable projection lens, this Ilex F:2.5 Dual Focus type projects sound-on-film to cover the same size screen area as sound-on-disc, holding images in true proportion without distortion.

**M**AXIMUM sharpness of definition, brilliant illumination with contrasty coal blacks and snow whites, and flatness of field are Ilex characteristics.



**A**DAPTED for use on all makes of projectors, this lens, by a shift of the lever, reduces the changeover operation to a minimum.

ILEX OPTICAL COMPANY  
ROCHESTER NEW YORK

INSIST UPON ILEX  
AND BE PATRON INSURED

A Mancall  
Publication

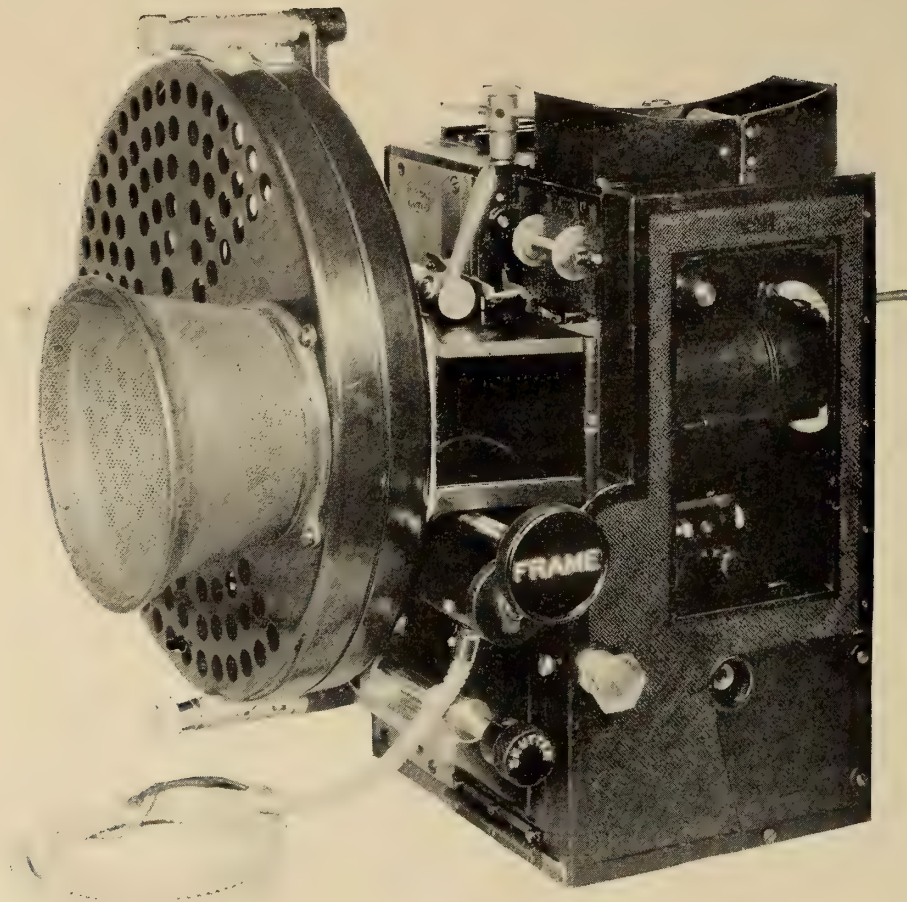
FEBRUARY, 1931

Vol. 4, No. 4  
15c. per copy  
\$2.00 per year



*Now Ready!*

# KAPLAN REAR SHUTTER



Can be Attached to Any Sure-Fit  
or Simplex Mechanism

*See your local dealer or write to us*

Sam Kaplan Manufacturing and Supply Company, Inc.  
729 Seventh Avenue New York City



# SPEAKING OF METERS



## WOULD YOU-

-attempt to project a perfect picture without a Voltmeter and Ammeter in your arc circuit?

-consider it possible to have perfect sound rendition without consulting the various meters on the amplifier equipment?

The Cue-meter is the most necessary and the most versatile instrument in the projection room. It indicates the correct time to start your motor and make your change-over. It shows you exactly where to vary your fader settings. It tells at a glance the proper time to close or open curtains, warn the stage, strike the arc, etc. Projectionists who are using them say that Cue-meters are indispensable.

Manufactured by

**THEATRE ENGINEERING SERVICE COMPANY**

1442 Beachwood Drive

Hollywood, California

For sale by all branches of the  
**NATIONAL THEATRE SUPPLY CO.**



**DON'T GUESS . . . USE CUE-METERS**



# Two Patrons

## ... Buy Your Carbons

**T**HE modern theatre and its furnishings represent the acme of splendor. The staff is thoroughly trained. Managers carefully select pictures in accord with popular taste. This lavish expenditure to attract patronage. Yet, if the screen is dim or the light unsteady, valuable patronage will be lost . . . . . and two empty seats cost more than your carbons.

Light is the most important factor in the operation of a motion picture theatre. That is why National Projector Carbons are preferred by the projectionist. They are dependable. And the manager knows that, with good projection, patrons will return and bring their friends.

National Projector Carbons give the steady, brilliant white light necessary for the quality of projection demanded by theatre-goers today. Their uniform quality is assured by the experienced organization behind them. *Two satisfied patrons will buy them.*



*National Carbon Company will gladly cooperate with the producer, exhibitor, machine manufacturer or projectionist on any problem involving light. . . .*

**NATIONAL CARBON COMPANY, INC.**

Carbon Sales Division      Cleveland, Ohio

Unit of Union Carbide  and Carbon Corporation

Branch Sales Offices: New York    Pittsburgh    Chicago    San Francisco



# MOTION PICTURE PROJECTIONIST

February, 1931

Vol. 4, No. 4

JAMES J. FINN, Editor

Lester Isaac, *Efficiency*; J. H. Kurlander, *Light*; Arthur Gray, *Conservation*; J. E. Robin, *Equipment*; Samuel Wein, *Research*; R. H. McCullough, *Sound Projection*; Harry Rubin, *Improvement*; Victor Welman, *Personnel*; Sidney Burton, *Production*.

Published monthly by Mancall Publishing Corp., 45 West 45th St., New York City. Subscription rates in U. S. and Canada: twenty-five cents per copy; two dollars per year; three dollars for two years. Add one dollar for foreign postage. Changes of address should be submitted three weeks in advance of publication date to insure receipt of current issue.

Entered as second class matter Oct. 25, 1927, at Post Office, New York, N. Y., under the act of March 3, 1879.

Canadian Representative

H. N. Elliott, Suite 11, 27 Sherwood Ave.,  
Toronto, Canada.

Australian Representative

McGill's Agency  
179 and 218 Elizabeth St.  
Melbourne, Australia

Editorial &amp; Advertising Office

45 West 45th St.  
New York City



## Effect of Sound Reverberation

The action of sound is similar to that of a bouncing ball in that the original sound continues to be reflected back and forth in the room after the actual source has stopped, and may be audible for several seconds. This continued reflection from one hard surface to another produces a lingering trail of sound, which is termed "reverberation." Sometimes the sustaining sound is called "echo" instead of reverberation.

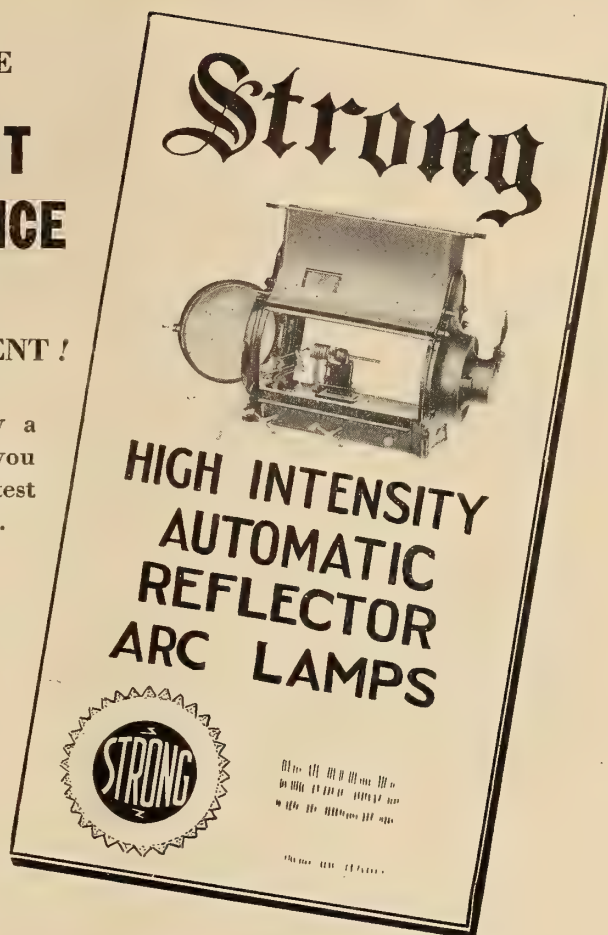
This is not strictly accurate, as the term echo is used to denote a sharp, which is distinct repetition of sound instead of the continuation of it. If sound lasts in a room five seconds after its source has ceased, it is said to have a "period of reverberation" of five seconds. It is evident that if the period of reverberation or the length of time that sound lasts in a room, is several seconds and a speaker utters from three to five syllables per second, the audience will hear a mass of syllables, from which they are expected to distinguish only the last one spoken. The human ear is not sufficiently acute to do this and in spite of straining, only a jumble of unintelligible sound is heard.

YOU CAN  
BUY AMPLE

## LIGHT INSURANCE

FOR ANY  
REQUIREMENT!

When you buy a  
Strong Lamp you  
buy the very latest  
type equipment.



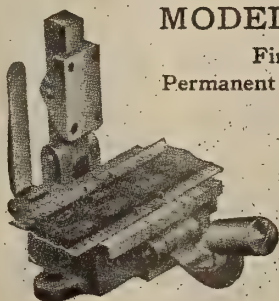
FOR SALE BY INDEPENDENT SUPPLY DEALERS

## The Strong Electric Corporation

2501 LaGrange St., Toledo, Ohio

Export Office: 44 Whitehall St., New York, N. Y.

## Universal Film Splicing Machine



MODEL NO. 3

Pat. March 22:22

First-Class Results on New or Old Film

Permanent Gauge

No Adjusting

FOR THEATRES, EXCHANGES  
LABORATORIES, SCHOOLS

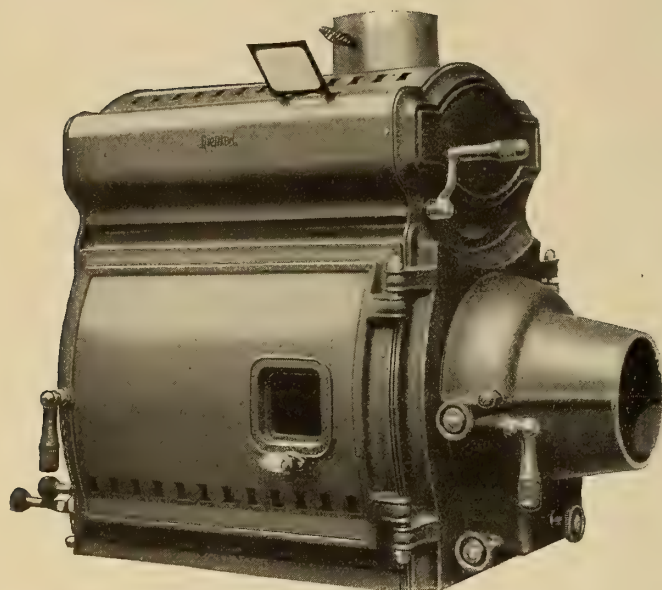
Price \$6.00

GENERAL MACHINE CO., INC.  
816-826 East 140th St., NEW YORK, N. Y.

For sale by all Supply Dealers



THE NEW  
**BRENKERT**  
 SUPER HIGH INTENSITY  
 PROJECTION LAMP



Consistently Produces  
**UNEQUALLED**  
 SCREEN RESULTS!

with

Higher Efficiency, More Accurate Operation,  
 Lower Operating Costs and Greater  
 Convenience

**PROVEN BY INSTALLATIONS!**

YOUR THEATRE CAN PROFIT  
 BY THESE ADVANTAGES

Manufactured complete in the large Brenkert plant. Sold  
 and Serviced by Dependable Dealers throughout the country.

WRITE FOR ILLUSTRATED  
 LITERATURE AND NAME OF  
 YOUR NEAREST DEALER

**"IT'S A BRENKERT PRODUCT"**

*Correct Design — Precision Construction*

**BRENKERT LIGHT PROJECTION CO.**

*Engineers & Manufacturers*  
 DETROIT, MICH.

## Hints on Fire Prevention

Inside the projection booth, it is recommended that carbon tetrachloride extinguishers be installed in a sufficient number to care for potential electrical fires. Immediately outside the booth or near the doorway, there should be located a foam type 2½-gallon extinguisher for use in case film becomes ignited. No soda-acid extinguisher should be located in or near the booth.

For the protection of the switchboard at the side of the stage there should be a 1½-quart carbon tetrachloride extinguisher easily available. At least one 2½-gallon foam extinguisher should also be located on each side of the stage for general protection. Soda-acid extinguishers should not be located near the switchboard on account of the danger of electrical energy being transmitted back through the stream to the operator.

### Ample Supply of Chemicals a Necessity

If there is equipment in the basement requiring the use of gasoline, oils or other inflammable liquids, 2½ or 5-gallon foam extinguishers should be installed.

Other portions of the theatre, such as the manager's office, dressing room corridor, property rooms and other portions of the stage other than the switchboard section, should be protected with foam type extinguishers or soda-acid type 2½-gallon extinguishers.

Recharges for this equipment should always be available so that equipment may be recharged immediately following a fire. Fire-fighting equipment should be regularly inspected to make sure that it is in operating condition. Foam and soda-acid type extinguishers should be recharged annually. There should be regular inspections of carbon tetrachloride extinguishers every six months to make sure that the pump is in working condition, the nozzle free from dirt, and the device filled with fire-fighting liquid.

## ROSS LENSES

ARE IN ALL  
 THE BETTER  
 THEATRES.

==  
 THERE IS A  
 REASON



**ROSS-F2-4**  
 PROJECTION LENS

Specify  
 the Ross  
 F2-4

For Your  
 Theatre

==  
 SOLE DISTRIBUTORS  
 IN U. S. A.:—  
 The NATIONAL THEATRE  
 SUPPLY CO.

IN CANADA:—  
 INSTRUMENTS, LIMITED  
 OTTAWA and TORONTO



## THEY KEEP A-RUNNING



20/40 to 100/200 Ampere 2-Bearing Actodecor

## QUIET OPERATION

**ROTH**  
 Emergency Lighting  
 Plants

are giving thoroughly  
dependable satisfac-  
tion in many of the  
largest circuit and in-  
dependent theatres.

The smooth, quiet performance of Roth Multiple Arc Type Actodecors in Motion Picture Theatres makes them especially suitable for use with projection sound equipment because no interference is set up. This is possible because Actodecors are especially built for projection service and are therefore designed and dynamical-ly balanced to eliminate noise and vibra-tion. Furnished in 2- and 4-bearing types.

**ROTH BROTHERS AND COMPANY**

*Division of Century Electric Company*

1400 W. Adams St.

Chicago, Ill.

*Distributors and Offices in all Principal Cities*

DIRECT CURRENT  
MOTORS AND  
GENERATORS



MOTOR GENERA-  
TOR SETS AND RO-  
TARY CONVERTORS

ACDC-2



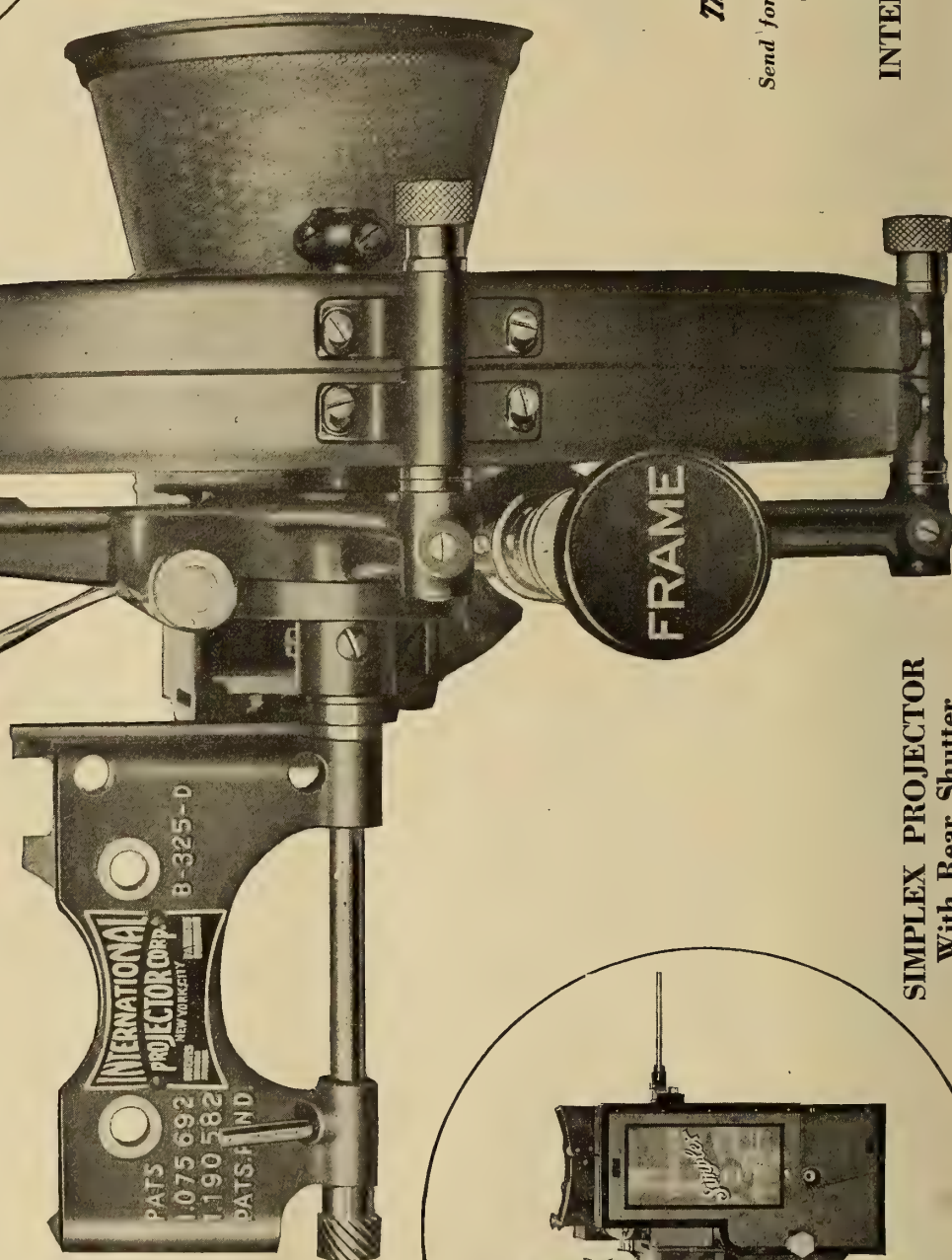
# REAR SHUTTER ASSEMBLY

For

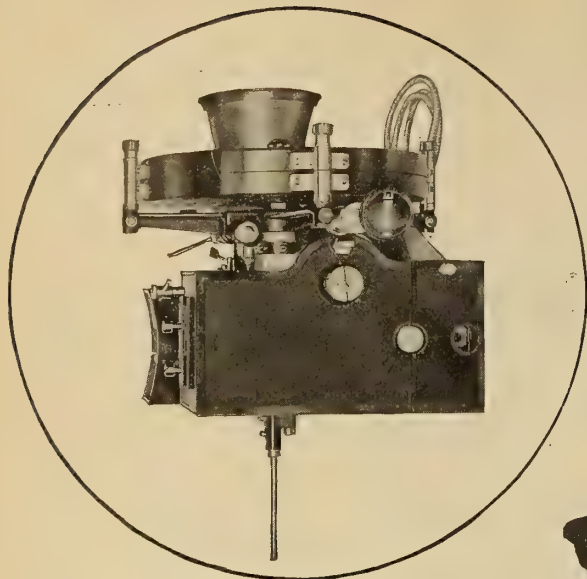
*Simplex*  
TRADE MARK REGD.

## REGULAR PROJECTOR

Can Be Easily Attached . . . Gives Many Advantages of  
the New Super Simplex at Moderate Additional Cost



**SIMPLEX PROJECTOR**  
With Rear Shutter  
Assembly Attached



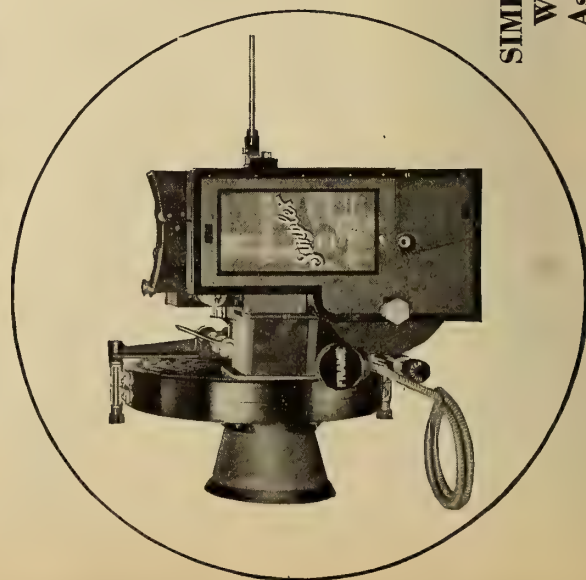
**SIMPLEX PROJECTOR**  
Showing Rear Shutter  
Assembly

*Simplex*  
*The International Projector*

Send for Booklet RSA giving full particulars  
and installation instructions.

**INTERNATIONAL PROJECTOR  
CORPORATION**

90 Gold Street New York





# "Noiseless Recording" (Western Electric System)<sup>1</sup>

By H. C. SILENT

*Development Engineer, Electrical Research Products, Inc.*

IT is common knowledge that, when a sound print of the variable density type is played in a reproducing machine, the volume of the reproduction is low if the print is dark and if a compensating adjustment is not made by turning up the fader. In addition, the ground noise of the film is also low. It has been a problem to take advantage of this latter fact with the former methods of recording because the mere act of printing the sound track dark, while it reduced the ground noise, also reduced the volume of sound from the film. This, of course, was undesirable. In the method of recording which is now being employed, these undesirable effects are overcome by regulating the density of the sound track at the recorder automatically.

It is well known that there is a particular value of density or transmission of the photographic emulsion which permits of the loudest volume from the film without exceeding the photographic limits of good quality. Deviation from this point is possible without distortion if the volume or percentage modulation applied to the

film is reduced. This can be taken advantage of by causing the film to be dark on low volume modulation, and as modulation becomes higher we lighten the film to the point where it has the greatest possible carrying capacity.

## Reduction in Ground Noise

If this can be done without distorting the volume of sound reproduced by the film, then we shall have a condition where the ground noise from the film is low during periods of low sound. Thus quiet intervals in the sound will be quiet and the ground noise, even though it rises with the sound, will always be more or less drowned out by the increased sound so that there is an effect of considerably reduced ground noise. In other words there is produced a constant signal to noise ratio in which the signal is always very predominant over the noise, and since noise is most noticeable in the quiet intervals there is a very real reduction in the amount of the ground noise.

There are a number of methods by means of which this variation in the transmission of the film can be effected. If we examine for a moment the light-valve employed in the Western Electric system of recording,

we shall see how one of these methods can be applied.

In the past, this system has employed a light-valve in which two ribbons were normally spaced .001" apart. These ribbons were vibrated by the sound currents, moving but a slight distance on weak currents and a considerable distance on loud currents. The strongest currents would just bring the ribbons into contact as they vibrated. The space between them was therefore greater than necessary to permit the free vibration of the ribbons on weak currents. A sound track recorded under this method had a constant density corresponding to the one mil. spacing between the ribbons and this density was caused to vary with the voice currents but maintained always its constant average.

Under the new system of recording an auxiliary electrical circuit is associated with the light-valve, so that when the sound currents are small and the ribbons need vibrate over but a very small amplitude, they are brought close together and this small vibration almost entirely fills the space between them. Then, as the sound increases in loudness, so that the ribbons are required to vibrate with a greater amplitude, the spacing is automatically increased by the electrical circuit, so that it is always just a little more than sufficient to permit this vibration of the ribbons. This is equivalent to altering the average spacing of the ribbons, so that it is at all times proportional to the envelope of the sound currents.

Now, if we regard the amount of light which passes through the average spacing of the ribbons to the film, we find that this light is considerably reduced during moments of silence or of low sounds, which results in a dark sound print. As the ribbons open up for increased sound currents, the amount of light correspondingly increases and a lighter sound print results. Since the actual vibration of the ribbons under the action of the sound currents has been undisturbed in this process, the amount of change of light which reaches the film and in turn the reproducing photoelectric cell has been unaltered even though the total amount of light has been decreased. Since the amount of change of light is unaffected, there is no volume distortion on reproduced sound as a result of this method of recording.

The extent to which the light-valve ribbons may be closed during quiet intervals is necessarily limited. They

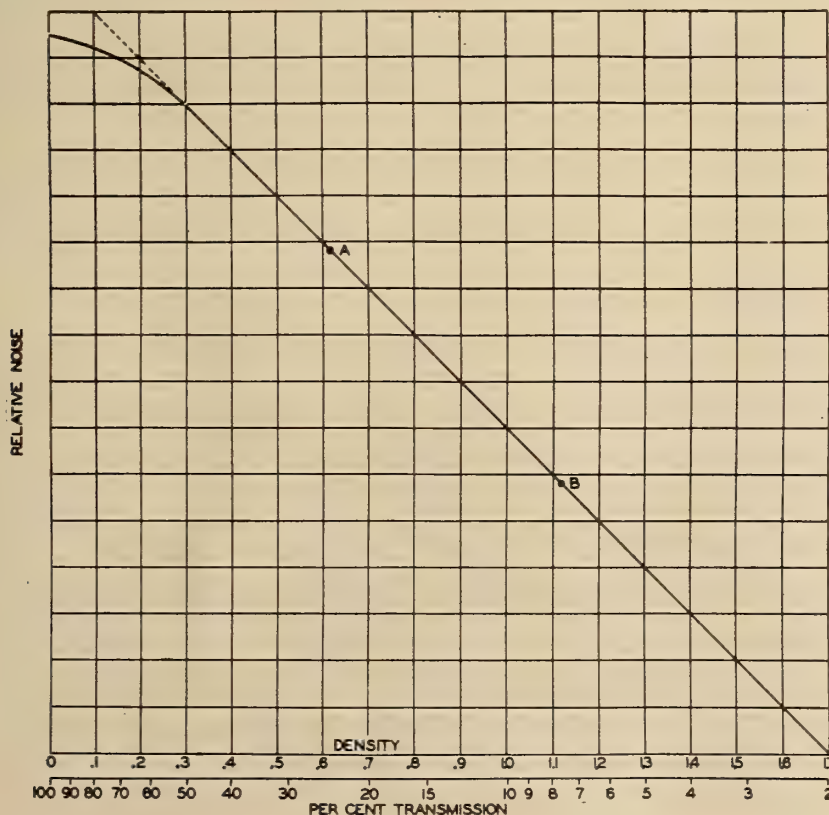


Fig. 1. Approximate variation of reproduced noise vs. density of sound track

<sup>1</sup>A paper from the Technical Digest Service, Academy of M. P. Arts and Sciences. Copyright, 1930, by the Academy.



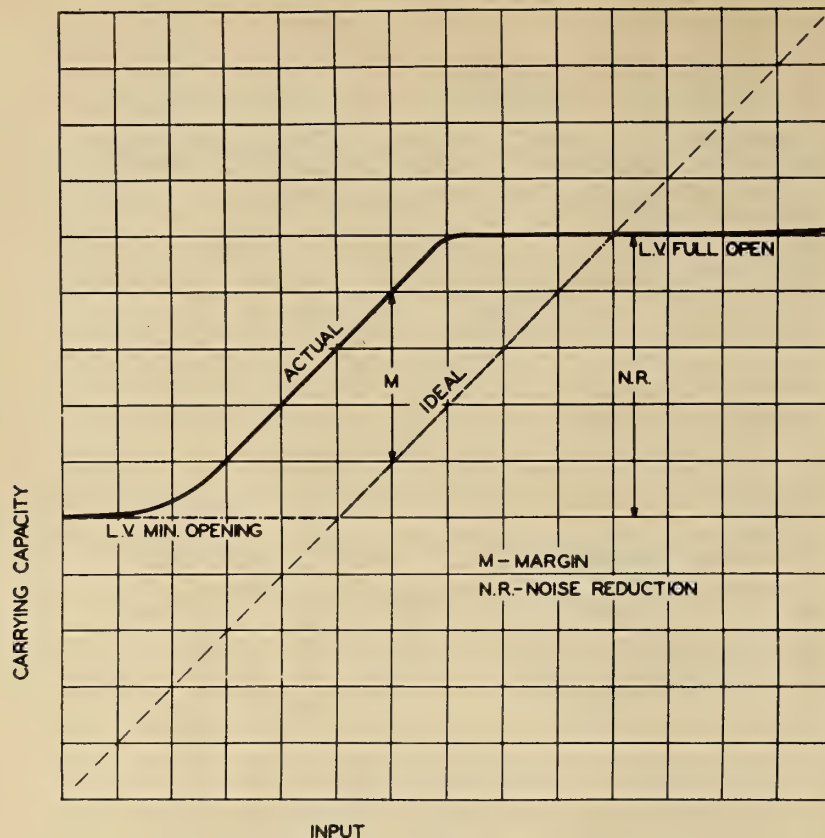


Fig. 2. Light-valve carrying capacity vs. input

must not be completely closed, because it is not possible to construct a device which can instantaneously sample the amplitude of the sound currents and set the ribbons to their proper spacing without introducing expensive delay circuits as auxiliary equipment.

#### No Change in Technique

Therefore, in setting up the device, the spacing of the ribbons is reduced to something considerably less than their normal spacing but not as far as complete closure. Furthermore, the latitude of the photographic emulsion is not infinite and also limits the extent to which the closure of the ribbons may be effected without exceeding the straight line part of the emulsion characteristic. Since this new method contemplates recording over the same part of the film characteristic, and within the limits of this characteristic previously utilized, there is no change in film technique. The processing which produced the best quality of reproduction with the former method gives the best quality with this new method.

Referring to Fig. 1, which is an approximate characteristic of the ground noise obtained from film of various densities, the point A indicates the approximate density employed in normal recording. By shifting the ribbons to have something less than their normal spacing, we can increase the density during the quiet portions of the sound track to point B. This results, then, in a reduction of the noise in the quiet intervals. Then,

as the sound currents are applied to the valve, its spacing automatically varies, so that it at all times has sufficient carrying capacity, as represented by the spacing between the ribbons, to carry the applied sound currents. A slight amount of margin is always established as a factor of safety, in order that a sound which builds up suddenly will not clash the ribbons.

The manner in which the carrying capacity of the light valve or, in other words, the spacing of the ribbons varies with the applied sound currents is illustrated in Fig. 2. It will be seen from this that for weak sound currents below a certain minimum amplitude the ribbon spacing is always the minimum, and the average

spacing is unvarying. As the sound currents build up to near their maximum amplitude, it is seen that the average spacing of the ribbons (or their carrying capacity), is gradually increased up to a maximum which corresponds to that of the normal light valve. As the input is further increased, there is no further increase in the ribbon spacing, and clash occurs as in the normal light-valve.

#### Overloads Occur Simultaneously

It is entirely possible to continue the carrying capacity of the ribbons upward by allowing their spacing to exceed the normal spacing. No useful purpose is served by this, however, since the carrying capacity of the photographic emulsion would be exceeded by so doing and an effect equivalent to clashing of the light-valve would be obtained. Therefore, the device has been purposely arranged so that photographic overload and light-valve overload occur simultaneously, if the recording lamp has been set for normal recording.

The general principles of noise reduction for sound records on film may be applied to other than the present form of light-valve recorders by making circuit changes as required by the particular type of equipments involved.

Operation of the apparatus employed in this recording system is relatively simple, although considerable time and effort have been spent in its development. The equipment is divided into two units—an amplifier located usually at the location of the main amplifiers and a control unit fed by the amplifier and located at the film recorder. These units are shown in Fig. 3 and Fig. 4. Adjustment of these units is simple and means are provided for checking the adjustments quickly and at fairly frequent intervals.

At the present time commercial recordings are being made with a reduction of ten decibels in the ground noise. It is expected that as more experience is gained in the use of this equipment, the noise reduction may

(Continued on page 13)



Fig. 3. Amplifier for "noiseless" recording system





**1926** Sound pictures become a commercial reality as recorded and reproduced over the Western Electric System



**1927** Dialogue is successfully synchronized with sight as the first Western Electric recorded all-talking picture is exhibited



**1928** Leading producers contract to record by the Western Electric system exclusively



**1929** ERPI's nation-wide service staff succeeds in reducing program interruptions at W-E equipped theatres to less than 1/10 of one percent of playing time



**1930** Western Electric quality is made available to small theatres in new models distributed at from \$2950 up.

*... and now in 1931*

# Noiseless Recording

The greatest development since the introduction of talking pictures themselves . . . recording that does away with all ground and surface noises and gives only what the microphone was intended to record, with higher standards of quality.

Noiseless Recording is an outcome of the constant striving for perfection in the Western Electric Sound

System. Pictures made by this new process are most profitably shown when reproduced over Western Electric Equipment.

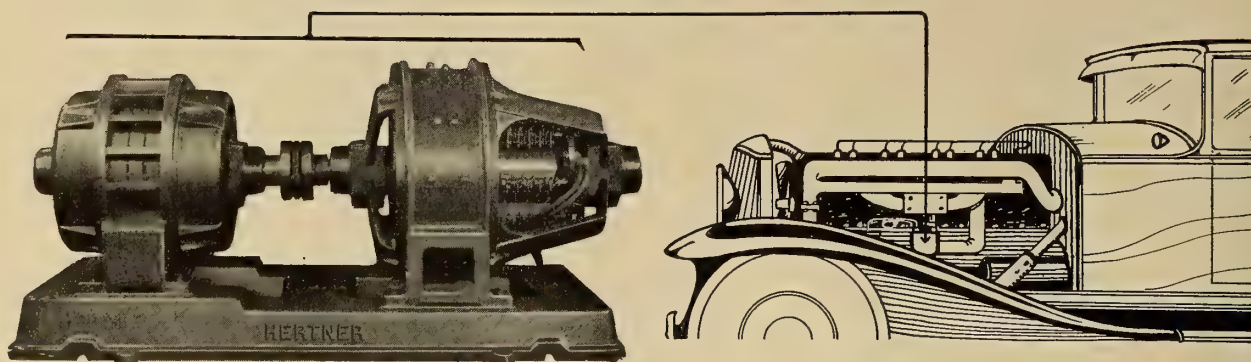
**Western Electric**  
NEW  
PROCESS  
NOISELESS RECORDING

*Distributed and Serviced by*

ELECTRICAL RESEARCH PRODUCTS INC., 250 WEST 57th STREET, NEW YORK CITY



# HOW MANY MILES DO YOU GET TO A GALLON OF GAS?



*Translated into Your Business —*

## The **TransVerteR** is the Carburetor of the Projection Room

### Side Lights on the Transverter

There is a certainty of satisfaction when you purchase the Transverter.

It has been on the market continuously since 1915.

Ever in the lead, ever the best that can be built.

It "screens" and holds back excess voltage. It makes each Kilowatt do its full duty.

Your current bills will show sufficient saving in the long run to entirely pay for this equipment!

Meanwhile . . . you will be obtaining uniform, quiet projection, automatically produced through accurate voltage control. Your audience will thank you.

*The Transverter is manufactured exclusively by The Hertner Electric Company.*

*Sold throughout the U. S. A. by  
The National Theatre Supply Company*

Why not write us today . . . and find out what the Transverter can do for you.

# THE HERTNER ELECTRIC COMPANY

12688 Elmwood Avenue

**TransVerteR**

Cleveland, Ohio, U. S. A.





Fig. 4. Control unit for "noiseless" recording system

be increased. Even ten decibels is a very noticeable reduction and permits an extension of the volume range to a point where sounds previously completely obscured in ground noise become definitely a part of the reproduction with a consequent considerable enhancing of the dramatic effect and naturalness.

The practical elimination of this

ground noise in the theatre gives to the audience a feeling of being present at the action and a removal of the mechanical from the sound. The average theatregoer's reaction seems to be one of finding the picture "easy to listen to" and possessing a naturalness which all but places it in the class of "original" instead of "reproduction."

## New Projection Optical System

By I. L. Nixon†

MOTION picture work, both in production and reproduction, makes large demands on the optical maker's skill, and a constant battle is being fought in the laboratory and in a proving ground which includes the studio and the theatre to raise the standard of optical instruments. Much progress has been made in this field, particularly in the last few years, but the optical workers' task is never done. Recent developments in the motion picture field have increased this responsibility tremendously, particularly with respect to sound picture reproduction and, in the offing, wide film.

The Cinephor series of projection lenses made by Bausch & Lomb has met with considerable success in the motion picture field and the Scientific Bureau of this concern is busy at present in seeking the answer to several pressing problems presented by the unique demands of this field.

There was first developed a photographic lens known as the "Raytar" which met with much favor in several studios, and simultaneous with this work was being carried on in the development of a higher quality projection lens. Such a lens was introduced a short time ago. Marketed under the name "Super Cinephor," it has met with considerable success.

Prior to the introduction of the Super Cinephor projection lens, those lenses available fell in two general groups: one of a construction known for many years as the "Petzval" type

of lens of which the regular Cinephor is a representative type, and the other, known as a "short back focus" type which essentially in construction would represent the use of a telescope objective with an achromatic condenser mounted a short distance ahead of the film which functions simultaneously as part of the illuminating unit and as part of the projection objective.

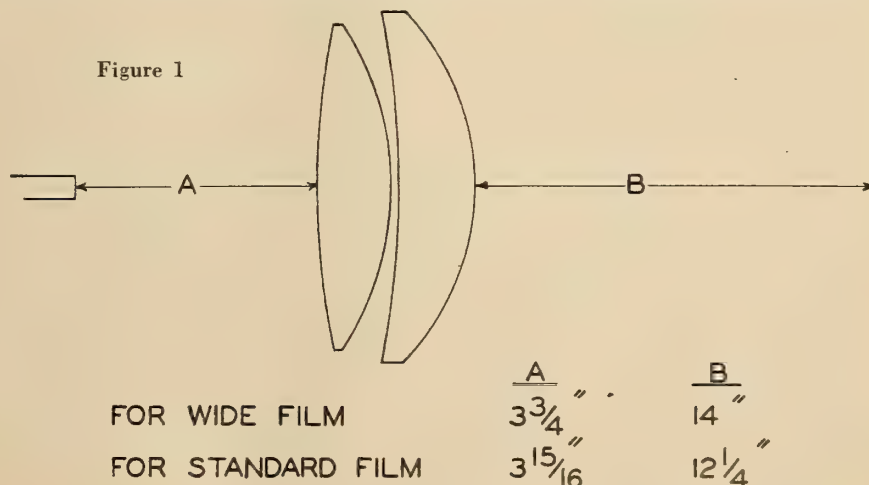
Both of these types of lenses have been characterized by more or less of the same type of performance, that is, rather sharp central definition and a comparatively small field of view which can be called absolutely flat. The latter type of lens suffers somewhat more than the Petzval as to field of view. The Super Cinephor lens is a true anastigmat lens being the first

projection lens of this type to be introduced. This means that this lens is corrected for both astigmatism and curvature of field and consequently has an angle of view far in excess of that of any other type of lens heretofore offered without sacrificing in any way the central definition that has characterized the other types of lenses.

The significance of this development and its importance to the exhibitor will at once be appreciated when considering the use of wide film pictures or the producing of wide film effects from standard film by the use of short focus lenses and high magnification. In the case of wide film (23 x 46 aperture, as has been proposed), it will at once be recognized that the angle of view which the lens must cover has been doubled over that of the regular film, which means that except in the case of very long focal lengths none of the lenses previously on the market will satisfactorily project such an area.

The Super Cinephores are made in a range of focal lengths from 2 in. up to 5½ in. in steps of ¼ in.; and those from 3½ focus and longer project the wide film with flatness of field, freedom from astigmatism, and with a sharpness of detail. The shorter focal lengths are particularly suggested for those which may be projecting "Realife" film or projecting the "Magnascope" wide screen effect from any standard 35 mm. film. Anyone who has attempted projecting such film with lenses in the neighborhood of 2 in. focus has without doubt, been disappointed in the results, while now the Super Cinephor will solve that problem.

Simultaneously with the work on the Super Cinephor lenses experiments were being carried on a condensing system that would make it possible to increase the illumination, this having been made necessary largely because of the perforated screens which were installed with the introduction of sound. About this time there came up the question of the illuminating of the wide film and that of course, presented a very serious problem. This problem has been most satisfactorily solved with the Super



† Bausch & Lomb Optical Co.



Cinephor condensing system which consists of a  $5\frac{1}{2}$  in. dia. rear condenser of spherocylindrical construction and a front condenser of 6 in. dia. of a meniscus parabolic construction. The rear condenser is used with the axis of the cylinder in a horizontal plane, and the result is an oval shaped spot of light on the aperture plate, which obviously means conservation of illumination. In addition to that the condensers are of high angular aperture, which also means additional illumination.

The working conditions, that is, the spacing must be very definitely set up with this system, as indicated by Fig.

1, in which "A" indicates the distance from the crater to the surface of the rear condenser, and "B" from the front surface of the front condenser to the aperture plate. These condensers are made of a heat resisting glass especially developed in our glass plant. Both the Super Cinephor lens and these condensers are now available through the regular channels of distribution, the lamp houses of three different lamp manufacturers having been adapted to take the condensers, and the Super Cinephor lenses are supplied with adapters as may be required for either Simplex or Super Simplex, but when

orders are placed the type of machine on which they are to be used should be indicated.

A considerable number of the leading theatres of the larger circuits are already equipped with these systems, outstanding installations being that at the Roxy Theatre and the Capitol Theatres in New York where the "Big Trail" on "Grandeur" film was run at the Roxy, and "Billy the Kid" on "Realife" film at the Capitol. In both cases the real success so far as screen results were concerned was dependent upon this new system, embodying the features which have been described in this article.

## The Elements of Optics

By SIEGFRIED S. MEYERS †

### III

WITH reference to regular reflection, a mirror may be plane or it may be curved. Either of these types reflect light regularly. But, the curved surface can be made to behave just like a lens, and will obey all the laws and formulas to which lenses are subject. In short, a curved mirror obeys the laws of reflection, and still utilizes the formulas of lenses which obey the laws of refraction. Let us consider a simple concave mirror. This mirror has a certain curvature, and depends upon a circle the radius of which describes a certain arc. This radius is known as the radius of curvature, and is the distance from the center of the circle (center of curvature) to the arc which it describes. The principal focus is located exactly half way between the center of curvature and the mirror. In tracing the path of rays from the object to the concave mirror in order to produce the image, the following construction must be followed: (Fig. 1).

1. Draw a line from the center of the object through the center of curvature  $C$  to the mirror. This is the principal axis.

2. Draw a line from a point  $A$  on the object through the center of curvature  $C$  to the mirror and this will be reflected back on itself, as indicated by the arrow-heads.

3. From the same point on the ob-

ject, draw a line from  $A$  parallel to the principal axis to the mirror, and upon reflection, draw this through the principal focus  $F$ .

the image tends to coincide with it. As the object is brought between the center of curvature and the principal focus, the image becomes larger.

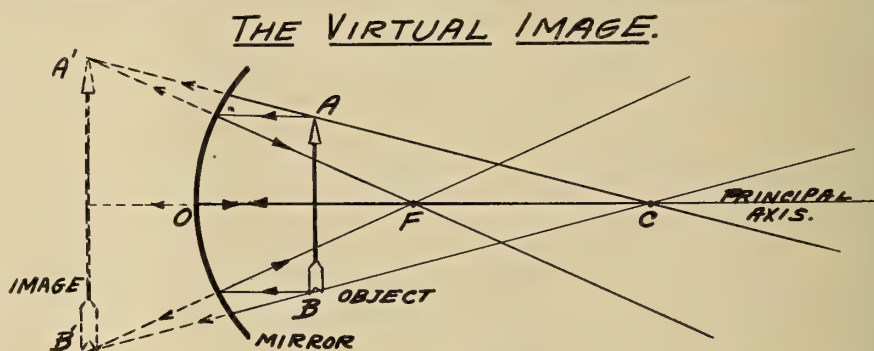


Figure 2

4. Draw the same lines for another point like  $B$  on the object, and these lines will intersect at such position, which will indicate the image and its exact size after reflection, as illustrated in Fig. 1.

It will be seen from Fig. 1 that if these lines are carefully traced, obeying the laws of reflection, an image will be produced on the same side of the mirror, which is real, inverted, and diminished in size. Apparently from this, it will be seen that if we move the object  $AB$  nearer the mirror, the path of the rays will be changed, resulting in a displacement both in size and position of the image. The nearer we bring the object to the center of curvature, the more nearly

Let us see how a concave mirror is used to produce an enlarged, virtual image, as is commonly seen in shaving mirrors. If the object is placed between the principal focus and the mirror, and if we trace the path of light from two separate points in the object according to the rules for image construction, we obtain results as indicated in Fig. 2.

#### The Virtual Image

Hence, we see that the image is not real, as we might expect it to be, but is rather virtual, for the image appears to be on the other side of the mirror, which is contrary to our expectations. Thus this image is said to be erect, virtual, and enlarged. In motion picture projectors, the concave mirror is found to be indispensable in focusing the light source on the condensing lens. By properly placing the object, and by selecting the proper curvature of mirror, the exact position of a real image can be predetermined for a given projector.

#### The Convex Mirror

From the foregoing, it is apparent that the curvature of this mirror is taken from the inside circumference of a circle. Suppose we were to take a section of this circle, and instead of

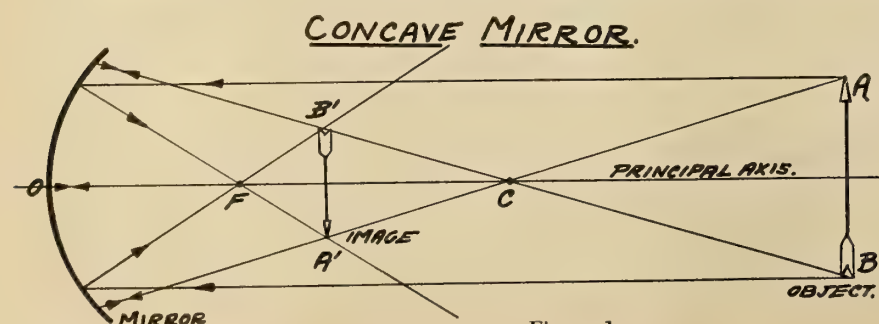


Figure 1

†Instructor of Physics, Stuyvesant High School, New York City.



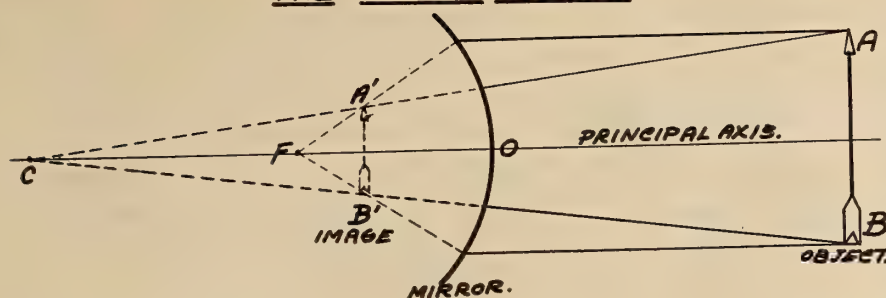
THE CONVEX MIRROR.

Figure 3

reflecting light from its inner curvature, we used its outer curvature. This outer curvature is the basis for the convex mirror. If we simply follow the same rules for tracing the image as we did previously, the position and size of the image will at once be apparent, and by properly placing the object, we can produce any size or position of image desired with a particular curvature of mirror. Let us trace the image from points *A* and *B* on the object to a convex mirror (Fig. 3).

In this case, the object *AB* produces a virtual, diminished, but erect image. A mirror of this type is used on the fender of an automobile for obtaining an image of objects moving at the rear of the car. The size and position of the image can be varied in this case, by simple computation of distances, if we know the radius of curvature of the mirror in question.

It is very important in the interests of good projection work that we understand reflection from curved surfaces, as well as refraction through lenses. It is interesting to note that reflection of images by means of mirrors frees the image of many aberration effects which are inherent in uncorrected lenses. Thus, it is quite feasible to design a projector which does not utilize a lens for projection, but rather depends upon reflection from curved surfaces. This method is very commonly used in astronomical observatories, where the aberration of lenses is a serious handicap to the work. Hence, reflecting telescopes are very practical devices.

It is also important to know that the amount of light absorption by reflecting mirrors must be taken into consideration. In lenses, reflection of light from the two surfaces of the lens, as well as transmission, takes place, and this reflected light is waste. On the other hand, most of the light is reflected by polished mirrors, and their only losses manifest themselves largely in the form of heat.

The Sound Head

With this as a background, the reader has a basic knowledge of the nature and behavior of light. Since he understands how to trace the path of light through any kind of lens or from any kind of mirror, he can very easily trace the path of light through

either the sound or action system of any projector. While we are on the subject of spherical mirrors, let us see how a spherical mirror may be used to advantage in the optical system in a sound head.

From elementary mathematics, we learn that the ellipse is a geometrical figure which resembles two curves whose ends are joined (Fig. 4). The ellipse has been used for many years in "whispering galleries." Briefly, a whispering gallery is a structure, so arranged, that a person whispering at one end, is heard very clearly by another person at the other end, although they are situated an appreciable distance apart from each other.

Geometrically, the ellipse does not have a single focus, but rather has two foci, each situated equal distances from their respective vertices. Now, if a sound is produced at one focus, sound waves emanate in all directions, and each wave strikes a certain point on the curve, which is regularly reflected to the opposite focus. Since all the waves are brought to a focus, the sound is concentrated at that point, very little being lost by absorption at the reflecting surfaces. Referring to Fig. 4, if we substituted light for sound, we would have an excellent method of concentrating light which emanates from one focus and which is concentrated at the other focus.

If a source of light be placed at *F* the emanating rays would strike the surface of the ellipse and would be reflected in accordance with the laws of reflection. As a result, a concentrated image of the filament will

be formed at *F'*. This can be conveniently arranged to enter the light slit, and thence to the light sensitive cell. It should be noted at this point that light from all parts of the filament is brought to a focus, a thing which cannot be obtained by a lens system. In a lens system, hardly more than five per cent of the light reaches the slit, and still less remains after passing through the film. Therefore, it is quite important to get as much light to the slit as possible.

It should also be noted here, that the elliptical reflector need not be a total ellipse, but may simply be one-half of an ellipse, which is hollow and polished on the inside surface. The light source may be easily mounted so that the narrow line of the filament of the light source is placed at one focus. The slit must then be located at the opposite focus. Since it is inconvenient to move the slit about until it is exactly at the opposite focus, the light source and its elliptical reflector may be moved to and from the slit by trial and error, until all the rays of light are brought to a focus at the slit.

Lest too much hope be placed in the practical application of this type of optical system, it should be noted here that two difficulties must be considered. First, it is impossible to make a perfect ellipse, which will bring all the rays of the light source to a sharp focus; and second, some light will be lost at the reflecting surface due to absorption, which energy will manifest itself in the form of heat. However, in favor of this system, we will not experience any chromatic aberration, as we get in lenses due to dispersion of light in glass. The system has much in its favor, chiefly because it does not utilize light from a single direction as in the lens system, and hence offers more useful illumination for the light slit.

The Motion Picture Projector

Referring to Fig. 5, a diagram is given which traces the path of light from the source to the screen. A spherical mirror is located behind the

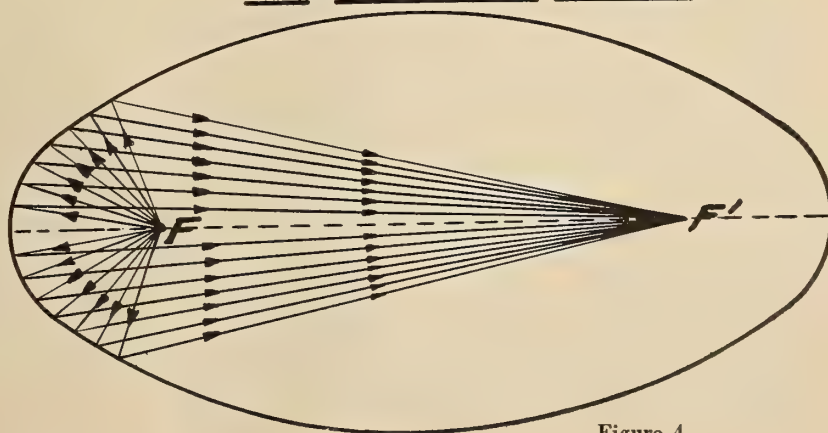
THE ELLIPTICAL MIRROR.

Figure 4



## THE MOTION PICTURE PROJECTOR.

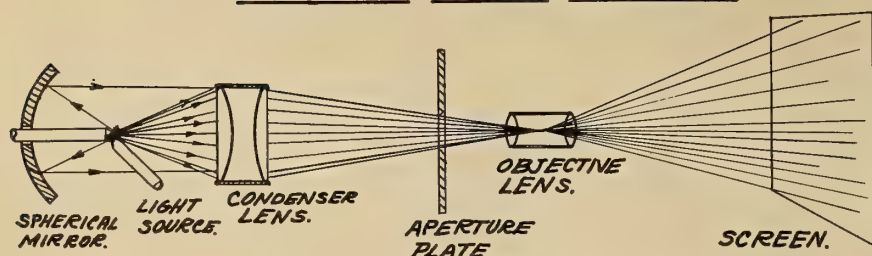


Figure 5

arc in such position that the arc is at the focus of the concave mirror. From what we have learned before, a source of light placed at the focus of the mirror will cause parallel light to be reflected from its surface to the condenser lenses. These lenses are usually made in pairs, each being of the plano-convex type. They are placed in a shell with their convex curvatures facing each other. The light from the arc passes through these lenses to the aperture plate.

### Regular Cleaning Essential

At this plate, most of the light is condensed so that the film will be intensely illuminated. It is the usual practise to adjust the light source and mirror so that the condensed light will more than cover the opening in the aperture plate. Thus, uniform illumination will result at the film, and these rays will pass through the objective to the screen. The objective must be of a certain focal length, so that the image may be clearly projected on the screen which is situated at a fixed distance from the projection room. The care of these lenses is of utmost importance. They should never be handled with the fingers, as this will show up at the screen, resulting in poor definition of the image. The outer surfaces of the lenses should be regularly cleaned with a piece of soft cloth to remove the dust and grit particles. The lenses should rarely be removed from the mount, because carelessness may result in scratching the surfaces or chipping the edges. Furthermore, if they are removed from the mount, no sharp instruments should be used, lest a slip should cause a scratch. Care should also be exercised in placing the lenses back in the same position as they were before.

With arc lamps, the condenser lenses must be frequently cleaned, owing to the excess dust particles which tend to be deposited on the lens nearest the arc. The aperture plate should also be kept clean from dust, as this shows up on the screen very prominently. In conclusion, the projector must be kept clean throughout the light path to insure good definition on the screen.

### Continuous Projection

There have been some recent advances in continuous projection. By continuous projection is meant motion pictures projected on a screen, but compensated for by some device other

than the conventional intermittent movement. Intermittent movement has stood the test of time, but it must be displaced by some more simplified method to meet the demands of present-day sound pictures. In the first place, intermittent movement is objectionable because it is a cause of vibration in the projector. The photo-electric cell being microphonic, picks up these vibrations, which are amplified together with the reproduced sound. Periodic illumination can never be as efficient as the non-periodic illumination claimed for continuous projection.

### Work Begun in 1900

Continuous projection dates back as far as 1900. Briefly, the solution to continuous projection is the design of a machine which permits the film to travel at a uniform rate of speed, and has some optical method that compensates for the motion of the film, and causes the image on the screen to appear stationary. Many inventors have attempted to design this compensating method, but practical difficulties of either design or manufacture have entered, which still acknowledge intermittent movement as their superior.

In some types of continuous projectors, methods have been tried wherein pieces of glass of various shapes and curvatures were used to refract the rays of light coming from the moving film, so that, as the film moves in a downward direction, the refracting medium will displace the image in the opposite direction, giving it a stationary appearance.

Others have attempted reflecting mediums, wherein light coming from the film is displaced by revolving mirrors so that the image appears stationary. All this is very pretty in words, but to design an optical projector which will uniformly displace the image of the continuously moving film is more difficult than it seems.

The practical solution to this problem is the proper design of spherical or plane mirrors which will obey the laws of reflection to the extent that they will displace the image proportional to the movement of the continuously moving film. If the solution cannot be found in mirrors, the proper shaping of a transparent substance like glass in accordance with the laws of refraction may solve the problem. Any system which utilizes more than one or two mirrors or lenses is doomed to failure, as the expense is too great to warrant the use of several carefully designed lenses or mirrors. As perfect as the design may be, there will always be a tendency for the image to go in and out of focus, due to the difference in foci of the respective mirrors or lenses.

Figure 6 shows an optical device patented in 1921 by S. Kucharski, which compensates for the movement of the film in the projector. His device and scores of others have appeared from time to time, but none has appeared to date which is practical enough and cheap enough to warrant the scrapping of the machines now in use, and the consequent substitution of the new machine, the continuous projector.

### Test Hearing With Audiometer

Electrical Research Products, Inc., have an audiometer at each Divisional office for the purpose of testing hearing. Upon request they will be glad to give you a test. This instrument resembles a miniature radio set, and has a scale of eight notes, each of which can be decreased in volume until the listener no longer hears any sound.

## CONTINUOUS PROJECTOR.

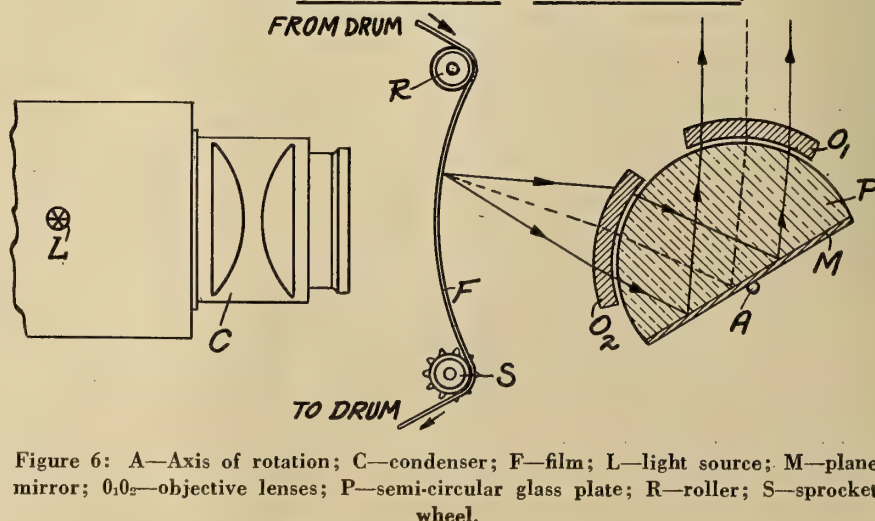


Figure 6: A—Axis of rotation; C—condenser; F—film; L—light source; M—plane mirror; O<sub>1</sub>, O<sub>2</sub>—objective lenses; P—semi-circular glass plate; R—roller; S—sprocket wheel.



# A Shallow Horn for Theatre Use

By H. B. ELY

*Member of the Technical Staff, Bell Telephone Laboratories*

**B**ECAUSE of their greater efficiency compared to direct radiators, loud speakers used for Western Electric sound-picture systems have been of the horn type. After considerable experimental work the horn shown in Figure 1, known as the 15-A, was finally adopted. The sound field of this horn for satisfactory reproduction is approximately 15 degrees on each side of the axis, so that a single horn is suitable for a long narrow auditorium. For wider auditoriums it is necessary to use two or more horns, properly flared, that is, pointed towards the sides of the auditorium; and this increases still further the depth occupied.

While the 15-A horn is satisfactory and economical for use in the majority of theatres, there are some cases where limited space would make its employment difficult. In many theatres the space between the screen and the back wall of the stage is not sufficient to accommodate this horn, which has a depth of 52 inches. Sometimes the screen is painted on the rear wall itself. Evidently a shallower horn would in many such cases avoid or minimize structural changes, such as recessing the rear wall or moving the screen forward and possibly encroaching on the seating space.

Another limitation is sometimes presented by houses where stage shows or vaudeville are given, as well as pictures, and it is desired to hang a back drop close behind the screen. Such a situation existed at the Roxy,

one of Broadway's largest theatres. The space between the screen and the nearest scenic drop behind was too small to accommodate the 52-inch horn.

A horn designed for these special cases should not only be shallow, but should also have a relatively wide angle of sound distribution, so that it can generally be used flat against the screen.

It was essential, of course, that while obtaining wider distribution and a horn depth under thirty inches, the performance characteristics should be as good as for the 15-A horn. A good response characteristic for the entire band of frequencies requires a fixed rate of taper from the small end to the mouth, and a certain minimum mouth area. Also, any bends in the horn must have a radius of curvature large compared to the width of the sound passage along the radius of curvature. The wide sound passage of the 15-A horn makes it necessary to start the bend some distance back from the mouth and is thus largely responsible for the 52-inch depth.

## 16-Type Horn Structure

The new horn, shown diagrammatically in Figure 2 and in actual photograph in Figure 3, attains its small depth of 26 inches by two major design features. While maintaining the same mouth area possessed by the 15-A, the opening of the new horn, which is known as the 16-type, is made oblong—44 by 60 inches—and the air column is divided into two

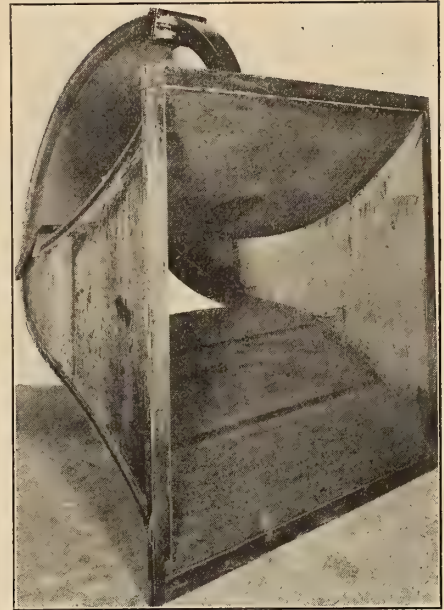


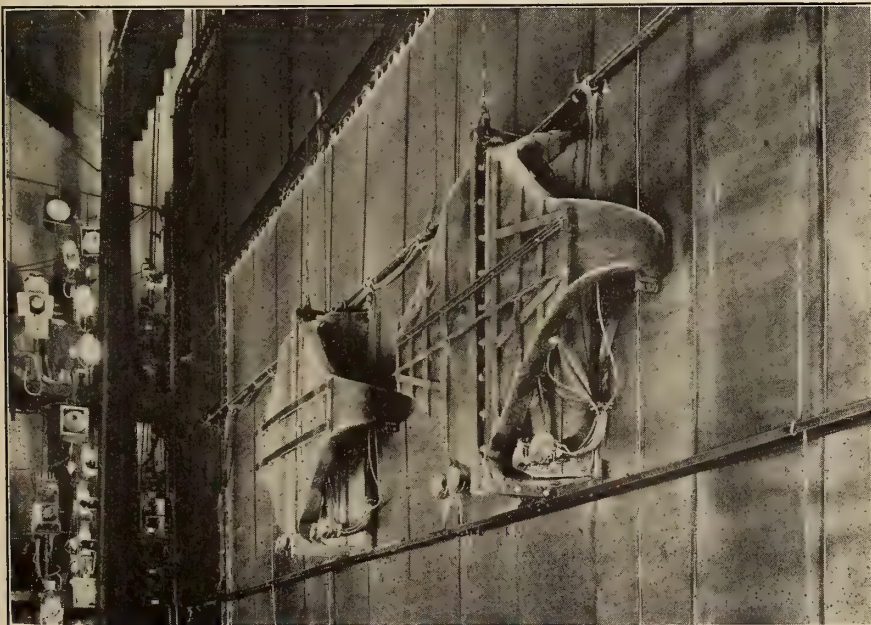
Fig. 1. The 15-A horn is of the logarithmic type with a mouth 52 inches square

equal branches a short distance back of the mouth. As a result, the divided air columns are much narrower and may thus be curved around shorter radii.

The two halves of the horns are curved in opposite directions around a 90 degree bend starting 14 inches back from the mouth, and then, after running straight for a short distance, make a 180 degree bend back on themselves, and then another 180 degree bend at right angles, as shown in Figure 3. The rate of taper for each half remains the same as in the 15-A air column but the cross-sectional areas at equal distances from the mouth are only half as large. These smaller areas permit the sharper bends without detriment.

Experimental models of the new 16-type horn were made of wood, fabric, and metal, and each was found to have practically the same performance characteristics. For practical reasons 1/16-inch sheet steel was used for the final form and all seams were welded to prevent rattling. Each throat section may be arranged for either one or two receivers of the 555-type. When two are used, as shown in the illustrations, the 36-inch single receiver section is replaced by a bifurcated section only 23 inches long. Here, too, halving the areas of the sound passages permits shorter length with the same taper.

At low frequencies, where the wave length of sound is comparable to the dimensions of the mouth, radiation is



Showing comparatively little space required by new horn mounting





Fig. 2. The new horn, known as the 16-type, has a divided sound passage which permits shorter radii of curvature

more or less non-directional. At the higher frequencies, on the other hand, where the wave lengths are relatively short, the radiation usually takes more the form of a beam. As a result the high-frequency radiation is likely to cover a smaller area than the low-frequency and the quality along the beam tends to be high pitched.

#### Efficient Sound Field

With the 16-type horn this effect is largely overcome by the divided opening which projects a double beam of high frequency radiation which more completely covers the field of low-frequency radiation. The divided mouth section acts as a single radiator for low frequencies and as two radiators for high frequencies. This permits the 16-type horn to be used satisfactorily where two or even three of the 15-A horns would be required since its sound field is approximately 45 degrees on each side of the center axis.

One of the first installations of the new horn, shown in the headpiece, was made at Roxy's theatre. Two of the experimental models of the 16-type horns are mounted on the trussed steel frame carrying the screen, and because of their small depth may be raised without interfering with the other drops. A heavy, dark material

is used to cover the back of the screen to prevent light, and to some extent sound, from reaching the audience from "back-stage." This may be seen in the photograph where the covering is cut and folded back to allow the horn mouth to lie flat against the perforated sound screen.

The receivers are here shown pointing to the rear of the horn instead of to the side as in Figure 3. Since the sound passage at this point is rectangular the most convenient position may be selected.

#### ERPI Assumes Distribution of New Sound Picture Screen

As the result of nine months of exhaustive tests at laboratories in New York and at the Lyric Theatre, Hoboken, New Jersey, Electrical Research Products has taken over the exclusive distribution of the "Ortho-Krome" motion picture screen. This invention has best been described as a new movie screen with a processed surface that eliminates glare, brings the most minute details of a picture into clear relief without eye strain, and offers the same amount of light to every person in a theatre regardless of the angle or elevation of a seat in relation to the screen. Other claims made for the screen are that

it has a longer life than the old-time screen and can be operated at a lower cost for electric current.

Its inventor is Albert Hurley, New York physicist, who has invented a process for removing the glare from the printed page and is now applying the same physiological principles to the development of a motion picture screen.

In announcing the new screen H. G. Knox, vice president of ERPI, predicted important changes in motion picture projection resulting from a better absorption of harmful light rays and a more uniform diffusion of light in a theatre. "Electrical Research Products is always interested in anything that will better motion picture projection because of its close connection with good sound reproduction," Mr. Knox said. "When this screen was first brought to our attention we moved slowly. For almost a year we conducted tests to assure ourselves that it was founded upon principles fundamentally correct and that it represented a genuine advance in picture projection.

"We are satisfied now. We have demonstrated that it lessens eye strain, reduces arc light power from 25 to 30 per cent, and is more nearly immune to chemical reactions that might impair its effectiveness in comparison with the old screen. Starting about February 1 we will have this screen available for all exhibitors. In cases where contracts for equipment include a screen, the new Ortho-Krome screen will be provided."

#### Physiological Principles Applied

From Mr. Hurley, the inventor, came the statement that the Ortho-Krome screen derives its importance from the fact that it was developed upon physiological, rather than upon physical principles with the effect upon the eye as the chief consideration.

"Heretofore," he said, "the surface material of screens has been selected from those giving the lowest ratio of brightness to someone in the center of the theatre and the highest to someone on the sides. The ratio was about ten to one on a silver screen, and about four to one on a beaded screen, and there was no way of adjusting this inequality because the screens were made from a practical standpoint without adequate consideration for the optical characteristics of the material used.

"The Ortho-Krome screen is based upon the principle that the material must be optically suitable before any other consideration enters into it. We experimented minutely, our experiments involving the designing and manufacture of instruments to measure light.

"We finally found a way, by using a pigment, by which harmful rays could be minimized by emphasizing other rays. The result is a screen which, while it reflects less light than the old time screen is still apparently

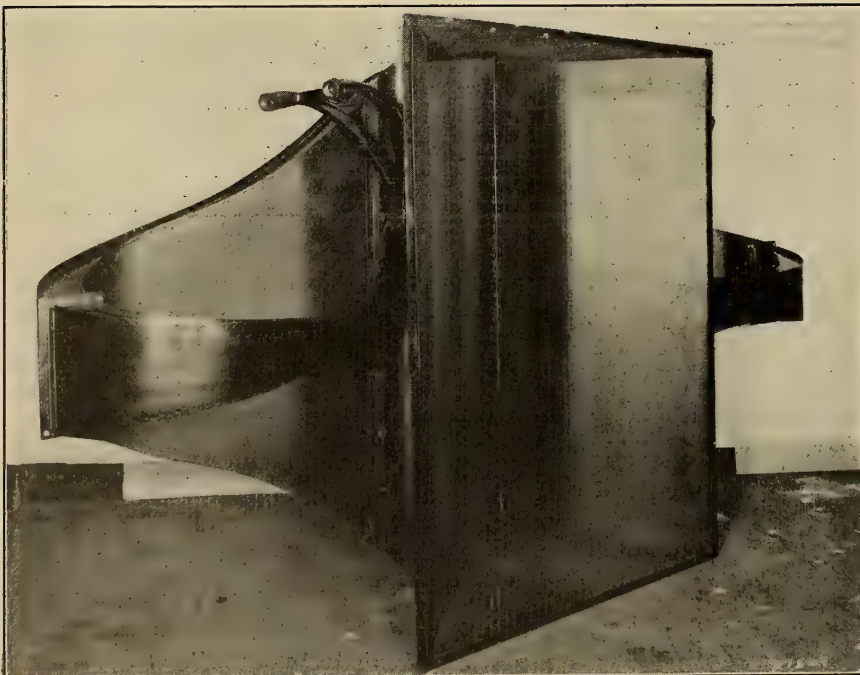


Fig. 3. Either one or two receivers may be connected to each sound passage of the 16-type horn



brighter, gives everyone in the theatre the same amount of light and produces a better quality of picture projection. We have accomplished this by regulating the amount, intensity and quality of light transmitted and reflected to the eye so as to relieve eye fatigue and nerve strain. From a practical standpoint we have proved

that the new screen can be operated at a considerable saving in electric current and that it will not turn yellow or disintegrate with time as the result of chemical reactions."

Mr. Hurley has been developing the Ortho-Krome screen over a period of years and has protected his invention by patents.

## Symposium on Large Screen Pictures

**R**ECENT activity in the wide film field, while failing signally in impressing either technicians or laymen of the necessity for a large screen picture and falling short by a goodly margin of forcing the issue in the matter of standards for the motion picture industry, succeeded in evoking considerable interesting and, for the most part, intelligent discussion of the problems involved in such systems and in charting a course for future progress in the field—that is, when and if the subject is revived.

How to do it has been the focal point of most discussions on this subject, and it was not until the latter stages of the campaign that the matter of the necessity for the step was considered. Economic considerations played by far the larger role in relegating wide film to the background—for the present, at least.

Probably the most interesting of all discussions of this problem was that held during an open forum conducted by the members of the S.M.P.E. at their last annual meeting in New York. Gathered at this meeting were enough members with actual experience in the work to insure a worthwhile symposium on the subject. The record of the discussion during this open forum are appended hereto and indicate the state of mind among technicians on this matter. The discussion follows.—J. J. F.

President Crabtree: In order to give everyone an opportunity to air his views on the possible methods of securing a large screen picture, we reserved a place on this program for an open discussion on the subject. As Professor Hardy pointed out, if the photographic emulsion were absolutely grainless, if it were sufficiently fast, if it were so hard that it could not be scratched, and that it would not accumulate dirt, then wide film would not be necessary. Enough light could then pass through the film to ensure a reasonably large screen picture.

It has been suggested that the 35 mm. film should be run sideways. I think Mr. Fear was originally responsible for that suggestion. Please correct me if I am wrong.

Mr. Fear: I believe I was the first. (Ed. Note: Several patents of E. Reis dated in 1913-14 show the same thing.)

President Crabtree: The wide image has been squeezed optically on the 35 mm. film and then stretched

out optically in projection. You can see an example of that at the Capitol Theater this week. This picture was produced by reducing an image on 70 mm. film down to 35 mm. film. It has been suggested that the sound be put on a separate film so as to permit of more picture space on the 35mm. film, and there is the suggestion of the Standards Committee to introduce a film intermediate in size between 70 mm. and 35 mm. There are probably other alternatives. I should like to have your opinions.

Mr. Stern: I gave a demonstration at the Paramount Theater on the 30th of September in which standard 35 mm. film was projected with the theater's own Magnascope projector on the large screen measuring 43 x 31½ ft. with excellent definition, and without excess granulation. This result was made possible by a special laboratory process of my own which will make feasible the use of large screens with 35 mm. film. I have also an invention for putting the sound track on separate film, saving the whole field for the picture. This invention consists of printing two sound tracks on 35 mm. film running in opposite directions. The film so printed is processed in the usual way and then slit in half, each half accompanying a reel of picture. It is wound on a special combination reel, of which one side carries the picture and the other side the sound track.

Mr. Ross: We strongly believe in maintaining standards whenever possible. We further believe it would be a mistake to adopt a standard of 50 or 65 mm. film or any size other than 35 and 70 mm. The small house does not have a large enough stage to accommodate wide screen pictures, whereas the de luxe houses have such stages. The de luxe house with its comparatively larger box-office receipts can easily afford to install 70 mm. apparatus, whereas the cost of such a change would be prohibitive to the small house. We recommend the use of 70 mm. film and apparatus for the de luxe houses and 35 mm. film and apparatus for the smaller houses. Furthermore, we believe that sound will eventually be recorded on a separate film. The sound for "Hell's Angels" is produced on separate film having two sound tracks. We will have more to say of this during the discussion of the question of sound on separate film. It is our belief that all pictures should be recorded on 70 mm. film;

however, we see no reason why pictures dealing exclusively with intermediate and close-up shots should not be recorded on 35 mm. film and optically condensed laterally for printing wide film 1 to 1.8 release prints. Mr. Fear has modestly refrained from mentioning his system wherein the pictures are recorded longitudinally on 35 mm. film, whereby 70 mm. pictures may be printed directly therefrom. This requires the building of new cameras but so does the use of 70 mm. film.

Another method of recording wide film consists of recording on 35 mm. film in the regular cameras, optically condensing the picture laterally during recording, and then optically printing normal pictures on 70 mm. film for the de luxe houses as well as optically printing normal pictures on 35 mm. film for the small houses. This can be accomplished by using bi-convex lenses, now standard products, which do not seem any different from ordinary printing lenses. In the final analysis we believe that all pictures will be recorded on 70 mm. film in the 1 to 1.8 ratio suggested, directly printed for the de luxe releases while for the smaller houses the 70 mm. pictures will be optically printed on 35 mm. film in the 3 to 4 regular ratio. This will make the objects appear slightly more slender than normal, an attribute for which all actors longingly crave. Obviously the suggestion for using 35 and 70 mm. standards has to do with permitting the manufacturers of film to continue the production of 70 mm. raw stock which may be employed for 35 or 70 mm. recording or printing.

Mr. Fear: Gentlemen, it occurred to me that you might be quite as interested in what we are doing in Hollywood as in the theoretical discussion of wide film. You have already seen two experiments, one of which was "Happy Days," and soon you will see "The Big Trail"—one of the finest picture epics ever made, due to the photography and wide film. Wide film furnishes a clear background; you will see close-ups and yet miles away there will be clearly defined results. This can only be accomplished on wide film. Big pictures and equipment cannot be installed in all theatres without properly considering the economic side of the question. The producers in Hollywood are trying to find the solution. The wide pictures produced cost too much to show. In one case special cameras had to be bought, but no projectors were available. It was suggested that an optically-reduced print be made and shown in 35 mm. projectors. The man who projected it knew something about this and was so interested that this method was adopted for release prints. It consists of reducing 70 mm. to 35 mm., using the full width of the film and a separate sound film. Two extra sound heads are required for the projection machine. (Continued on next page)



Other methods have been suggested, such as rebuilding the present equipment; this is feasible, but may involve considerable cost. In designing projectors there is a definite practical width which limits that of the film; it is the widest width of film that can possibly pass through the projector without rebuilding the latter. That width is 50 mm. If a film of that width is used the height must be considered. It is impracticable to use a higher picture in the theatres than is used at present, so it resolves itself into widening the picture. The solution, then, is a 35 mm. film widened out. This is the answer to the controversy on wide film in Hollywood. It applies only to release prints.

President Crabtree: Is Mr. Powrie here? With regard to reducing down from wide film on to 35 mm., if you look in the *Transactions* of the Society for 1924, you will find a paper by Mr. Powrie on the subject. He demonstrated the process and practically showed the improved graininess obtained by that method.

Mr. Ross: If we understand Mr. Fear correctly, he stated that wide pictures can be photographed only onto wide film. We again call your attention to the fact that Mr. Fear's system produces wide film pictures recorded on 35 mm. film.

Mr. Fear: The 35 mm. method I suggested last year solved the problem as to projection suitable for general use. The great difficulty lies in the matter of employing untrained men.

In Hollywood, we are producing the 65 mm. and 70 mm. cameras. MGM and Fox are using 70 mm. There is some difficulty which probably will be overcome, due to using four perforations instead of five. It has been suggested that five perforations be used. Warner Brothers, First National, and Universal are using 65 mm. cameras for their photography. Some prefer to make release prints on 65 mm. film. It is desirable to eliminate the human factor as far as possible in all laboratory work. There should be one negative of constant density without light changes due to the inexperience of operators who are likely to miss a light change. This can be done only by making a larger negative—65 mm. or 70 mm.; from this a master positive is made and corrected for light change. An expert technician should do this. Then an optically reduced duplicate negative is produced. This optically reduced negative will be superior in quality to an original of the same size because of the reduction of grain in such an optical print.

I think that answers your question; it is an economic problem.

Mr. Ross: I merely wish to add that in suitably reconstructed printers no prisms are required. Further, the question of making dupe negatives or fixed density positives seems to be apart from the question of wide film.

Mr. Griffin: The suggestion has been made that it is a good plan to reduce optically from a wide negative to 35 mm. film. I have seen pictures projected which were made in this manner and as far as pictorial quality is concerned the result is very good. It must not be forgotten, however, that the problem of projecting this type of picture to a screen 40 ft. wide is highly impracticable because it is impossible to pass the necessary amount of light through the small aperture. The size of the aperture in this case is approximately 0.940 wide by half that in height. Using 135 amperes at high intensity and condensers of the most improved design, it is impossible to procure more than half the illumination on the screen that is acceptable for the projection of standard film, and it is necessary that the projectionist be on the alert at all times to constantly secure even this result. It must also be remembered that this reduction print, running as it does across the film from sprocket hole to sprocket hole, allows for no sound track and it is necessary to record on either disk or separate film, which adds considerably to the cost of apparatus necessary for sound reproduction, to say nothing of the errors in synchronizing which may and do arise frequently under this system.

I don't think the solution lies in using 35 mm. reduced prints. I feel that the industry should certainly consider going to a film of, perhaps, 50 mm.; in which all the excellent quality obtainable in wide negatives can be incorporated and which we know can be satisfactorily projected. By adopting such a dimension all the projectors now in use could be converted to handle this size as well as 35 mm. film at comparatively little cost to the exhibitor compared with the cost of equipment for the wide film as we now know it. Such a standard would be economically sound and enable the production of wide film to go ahead without a great deal of delay. Our corporation has spent a tremendous amount of money on film equipment and wide films but I am sure we should be willing to discard this for a standard which is economically sound and which allows the salvaging of the greater part of equipment at present in use.

Mr. Stern: I should like to know if "Billy the Kid" was produced by making a 35 mm. print from the 70 mm., or was it an optical print from a 70 mm. negative?

Mr. Fear: It was produced by original reduction of the negative to the positive. On such a huge reduction, it is almost impossible to utilize the method I outlined before. I have a company in production on a wide film picture with four more to start in 90 days, which will be released to the independent exhibitor. We are making plans for a patent license to rebuild projection machines for a certain size film and are anxious

to have a standard to adopt. In our system of conversion of projectors the 35 mm. sprocket is cut in two so that the film is run throughout in the extensible position. We have added space between the sprockets. By moving levers we can change from one film to the other. The method is extremely inexpensive.

Mr. Ross: I wish to call attention to the fact that the frames in "Billy the Kid" are about one-third smaller in height than in standard 35 mm. film and that, therefore, in the systems in which we have suggested using standard size frames there will be available one-third more light, or an average of approximately 7 foot candles. Furthermore, whereas the foot candles have been reduced from, say, 11 to 7, the picture viewed has approximately twice the area and there will be as much illumination at an intensity of 7 foot candles on wide pictures as at 11 foot candles on regular size pictures. We believe that if the wide screen pictures were to be projected with an average screen intensity of 11 foot candles, the amount of light reflected by the screen would be objectionable to the audience, especially to those in the rear portion of the auditorium. Furthermore, with quick changes of scene the light and shadows reflected onto the walls of the auditorium would also be objectionable.

Mr. Fear: In Hollywood, everybody is enthusiastic about wide film. The producers are a little anxious about the situation because they want to know what is going to be done about it. No cameras are being sold for 35 mm. film. I will not sell them because I know we are going to a new standard and they will become obsolete in a short time. United Artists, Warner Brothers, First National, Fox, MGM, and Universal are working on wide film at the present time. One of my cameramen, Mr. J. O. Taylor, started on another picture last week. Every producer out there is awaiting your decision. It is highly improbable that every producer will have a different standard. In the majority of cases where we have handled wide film we have not had any technical difficulty. It is handled the same as the other, and the cameras have caused no more trouble than the others. The cameraman shoots a little differently from the 35 mm., but the main difficulty lies in projection.

Mr. Griffin: Mr. Fear said that difficulty has been experienced on the Coast in the projection of wide pictures. I know that to be so but I believe it is because the improper condenser combinations were used and improper distances were maintained between the arc and condensers and the condensers and aperture. We in the East are closer to the optical manufacturing organizations and lamp manufacturers and close co-operation has enabled us to obtain satisfactory results more quickly.



# New "Ortho-Krome" Screen Development

A new "Ortho-Krome" screen, exclusive distribution of which has been acquired by Electrical Research Products for immediate installation with all W. E. equipments, regulates the amount of light transmitted to the eye and prevents fatigue by applying a filter on the screen which suppresses part of the light rays and mingles those remaining with a certain proportion of the white rays, according to the inventor, Albert B. Hurley, who has contributed the following description of the development.

**T**HE method is based upon the fact that the light transmitted from a moving picture screen can be subdivided, regulated and composed so as to produce a balanced effect. This is done by suitably proportioning the filtering areas and the normal, or unmodified areas, so that each will subtend a visual angle of approximately 45 seconds to two minutes. This makes the method applicable to the transmission and reflection of light from any desired angle at any desired distance.

The average lamp radiates one-third more yellow and twice as many red rays as average daylight. On the other hand daylight gives the eye ten times as many blue and four times as many green rays as the average lamp.

## Correction of Light Waves

To remedy this, while we cannot fully duplicate actual sunlight, we can, by regulating the quality of artificially produced light, stimulate the quality of sunlight. Especially we can correct the distorted percentage of light waves in different parts of the spectrum.

In addition to regulating the amount, intensity and quality of light

reflected or transmitted, another important consideration is that of relative diffusion and distribution of light from backgrounds. By means of a spectro-photometer, white surfaces can be compared with magnesium, which is supposed to reflect blue-green and red in quantities to give the sensation of pure white. Contrary to the general belief, a test shows that almost all commercial white surfaces reflect a greater percentage of the longer wave-lengths. Eighteen white papers examined by the U. S. Bureau of standards (Technologic Paper 224), show that the average reflection of the red-green and blue was about 36-34 and 32 respectively, as compared with equal quantities reflected by magnesium. These papers viewed under the artificial light of the average lamp would show a decided yellowish tinge due to a preponderance of red and yellow rays in the light and to the paper's capacity for reflecting a greater percentage of these rays.

The artificial light used in reflecting motion pictures superimposes upon white or other of the now customary motion picture screen surfaces a glare sure to mean excess stimulation of the eye. This continuous glare not only tends to injure the eye but also to disturb the whole nervous system.

## Normal Reflecting Surface

The Ortho-Krome screen is a normal, reflecting surface, and the manufacturing consists of dividing this surface into a multiplicity of uniformly distributed circumscribed figures approximately equal in area; applying to a number of said uniformly distributed circumscribed figures a light filter that absorbs all or part of any

preponderant wave-length and reflects the remaining needed wave-lengths of the incident light.

Figure 1



The other uniformly distributed areas are left exposed and reflect unchanged the hue and value of the incident light received so as to produce a surface of uniformly distributed units. Each of these units comprise one filtering area and its related normal area, reflecting together a composite of wave-lengths the sum of which presents to the eye white light or light within the limits to which the eye can react normally and harmoniously, the size of said filtering area and the size of said exposed area being such as to subtend a visual angle less than that required for conscious resolution by the eye at any distance at which the surface is to be viewed.

The non-glare screen absorbs any preponderance of these rays that may be harmful to the eyes. At the same time it accentuates the beneficial rays that otherwise would be subordinated in the illuminant. This screen not only regulates the spectral character of the light received by and reflected from it but at the same time also diffuses it so that every person in any theatre will get exactly the same amount.

## Action of the Eye

The pupil of the eye reacts involuntarily. To protect the retina it will close about 60 times as fast as light rays can be made to open it. Keeping the pupil of the eye open to a diameter of three instead of two millimeters, by the right quality of light, produces the same increase of vision, approximately, as would result from several hundred per cent increase of artificial illumination.

Fig. 1 represents an enlarged fragment of a surface treated by one particular application of this method. The dimensions of each of the pigment squares, spots or figures are within certain defined limits of size according to the reflection factor and other characteristics of the surface to be treated. The number of these to a unit of surface determines the amount of the background surface exposed which may reflect the full hue and value of the incident light. By regulating the pigment mixture and the relative sizes of the pigment figure and the exposed surface in a unit of surface, one can regulate the amount and quality of the light re-

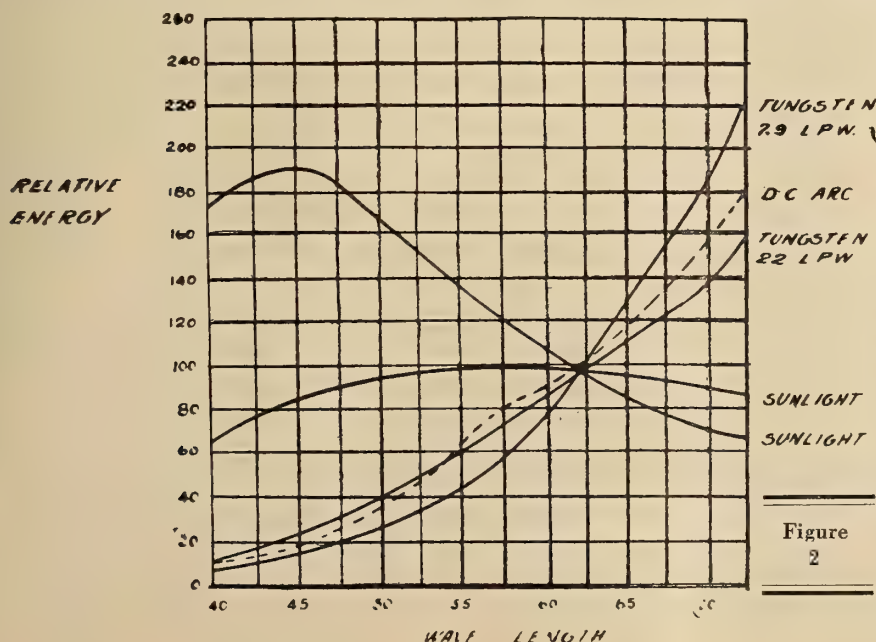


Figure 2



# As *The* EDITOR Sees IT

## ¶ "Depth" in Wide Films

IN the interests of truth and accuracy it becomes necessary once more to point out that the "illusion of depth" gained from a wide film has no connection whatsoever with the height, width or proportions of the screen itself. No announcement of a wide screen process would seem to be complete without some reference therein to this "illusion of depth," and in many cases depth is said to be actually contained in the process. As we pointed out before, the answer to depth in motion picture lies in the physiological rather than in the mechanical realm. No progress in three-dimensional motion pictures may be made until the requirements of the eye are established definitely—until the effect which is to be striven for is understood completely. Then, and then only, can the mechanic set to work with any reasonable hope of success.

## ¶ *The Council and The S. R. P.*

HERE is evidently a sharp difference of opinion regarding the new standard release print promulgated last November by the Academy of Motion Picture Arts and Sciences, with the cooperation of the American Projection Society and the Projection Advisory Council. The latter organization did practically all the work in connection with the introduction of this new standard, and it is the Council which has assumed the responsibility of seeing to it that the standard is observed. As a result of this activity by the Council—work which is purely and simply a labor of love by those members who unselfishly devoted their time and efforts to the task—not a little criticism has accrued to the organization. This criticism concerns itself in the main with expressions of disapproval from those who are opposed to the new release print, and who object to the Council lending itself to its general acceptance.

This criticism is unjust. The standard release print is not the pet of the Council. It is true that the Council, through certain of its members, aided in formulating the standard, and that it is now actively engaged in promoting its adoption. But the charge that the Council has made certain alliances for the express purpose of jamming the standard print down the throats of helpless projectionists is absolutely without foundation. The Council is functioning merely as a representative agency of projectionists and as such cannot exceed the powers delegated by its membership.

Neither the Council, nor the American Projection Society, nor the Academy is irrevocably committed to the new print. All these agencies welcome criticism of the print, for it is only through the medium of criticism that the way will be opened for improvement. For the information of those who have pressed us for our opinion on the new standard release print—an opinion which we have deliberately withheld—we wish to state

here that the plan is not perfect. Now that the secret is out, what of it? It is the best plan yet evolved; and when the machinery for its proper administration is in perfect running order (and it will be within the next few days), it will work even better. And the plan is at least perfect to the extent that there is nothing better in view. One of the disappointing features of the whole campaign thus far has been the utter lack of substitute plans suggested by those who are loudest in denouncing the present plan.

Give the standard release print a fair chance. We don't put on a perfect show every time we walk into the projection room. Be fair. The standard is only sixty days old; and it is promised that by the time it is twice sixty days old it will be vastly improved. Let's wait until the patient dies before we attempt to arrange for his funeral. And meanwhile, let's pay our dues to the Council and try to secure a few new members so that it may be able better to withstand these mid-winter verbal blasts.

## W ¶ *A Standard Projection Room*

WHILE we are on the subject of standards, who ever heard of a standard projection room? It is true, of course, that a few large circuits the theatre holdings of which constitute a small percentage of the total, have promulgated certain rules concerning projection rooms. But these rules cannot be considered standard, for there is disagreement between one circuit and another on many features of a standard room. Another condition which militates against the setting up of projection room standards is the variance in the safety codes of the several states. This in itself would be sufficient to make the promulgation of standards impossible.

We find it difficult to comprehend how an industry like that of motion pictures can proceed from day to day on such a slipshod basis. The reason for all this confusion is obvious: no one who occupies a high directorial position in the industry gives a hang about the technical end of the business. The nearest the executives get to the technical problems of the industry (and this goes for studios as well as theatres), is to be confronted with the cost sheets for technical equipment and technicians and to live on thereafter with a vague notion that such items are frightfully expensive. The absence of proper standards is not needed to prove this contention: witness the sound picture debacle—and more recently the color jumble—and, harking away back to the "dark ages," film mutilation. This last item would convict the accused immediately.

The matter of formulating projection room standards, with its accompanying requirement of beginning to classify and codify the various state laws on the subject, constitutes a challenge to the technical brains within the industry.



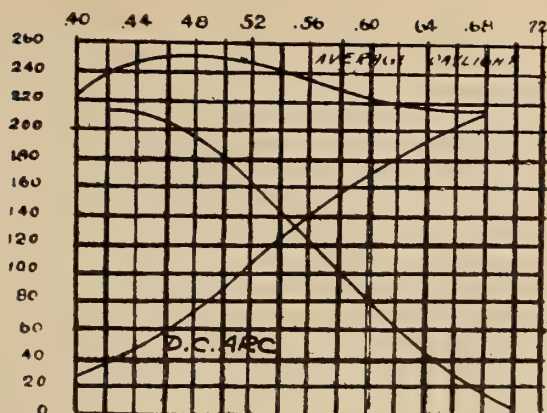


Figure 3

reflected and the stimulation of the eye can be increased or decreased to any desired degree while giving perception of white light.

Referring to the curves in Fig. 2, we note a great difference in the energy distribution of sunlight, skylight and artificial light sources. North skylight and noon sunlight, however, are fairly constant in color and the average of the two would seem to be a good approximation of the term white light or daylight.

We plot the curves of average daylight as shown in Fig. 3; and as the most common illuminant used in projecting motion pictures is the D. C. Arc, its spectral distribution of energy is shown and the curve is plotted so that the energy value equals that of the daylight curve at the point near the limit of visibility, or, at wave length 0.79  $\mu$ . Subtracting the ordinates of corresponding wave length of the D. C. Arc curve from those of the daylight curve the remainders, when plotted, show the curve indicated. This curve is practically complementary to that of the D. C. Arc

and means that if a light produced by the curve is added to the light produced by the D. C. Arc, the total light will be of the same spectral character as average daylight.

The relation between the radiation of various wave-lengths and their physiologic effect in producing lumi-

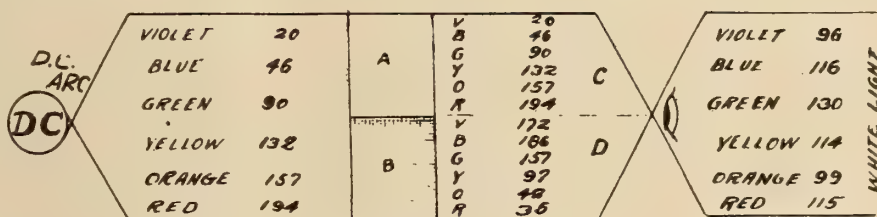


Figure 4

nous sensation must be considered; and the curve is corrected to some extent by multiplying the ordinates of the daylight and arc curves by the light giving value, or visibility of radiation figures, and then making proper allowance in the pigment mixture.

high, making the process more effective under artificial light. Furthermore the squares of pigments lower the reflection factor of the background and at the same time, by reason of their uniform shape and spacing they help diffuse the light to reduce glare.

## 11,500 Hours Without Interruption

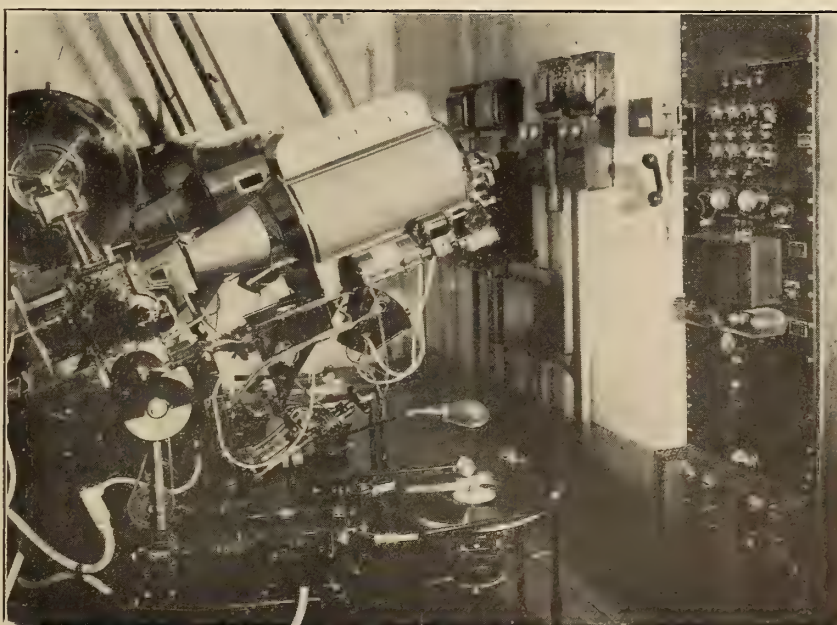
THE Missouri Theatre in St. Joseph, Missouri, opened with Western Electric sound system on August 26, 1928. It has operated since that time without a shutdown and without requiring one emergency call from an ERPI service engineer. This certainly constitutes some kind of a record, if one may judge from the glowing compliments paid this theatre's staff by Electrical Research Products Co., by whom the Missouri is considered a "model" house in this respect.

What is behind this remarkable record of performance—this perfect coordination between projection staff and service man?

ERPI modestly attributes a major part of the credit to the projection staff, composed of Messrs. M. F. Coots, B. E. Newkirk, W. S. Welsh, and H. R. Sisson, all members of Local Union 559. And the projection staff in turn disclaims any special credit and thinks that the whole thing may be traced down to a simple routine established when they first opened with sound pictures. In fact, the Missouri staff can see no reason why

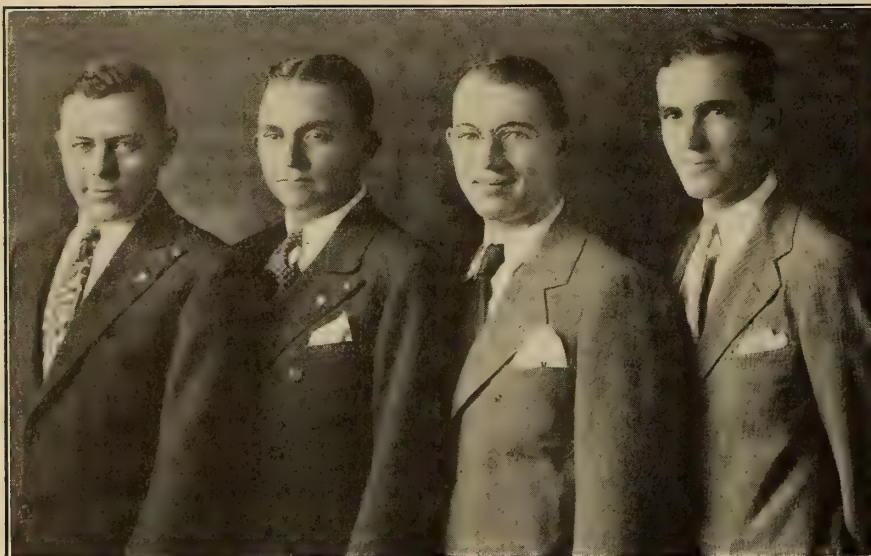
there should be emergency sound service calls from any theatre. Of

course, both ERPI and the projection staff are wrong on this point:—the answer lies in cooperation, with both projectionist and service man having



Projection room in Missouri Theatre





Projection staff of the Missouri Theatre:—M. F. Coots, B. E. Newkirk, W. S. Welsh, all members of L. U. 559

good equipment to work with and then proceeding to keep that equipment in such good condition by unfailing attention to detail that it *will* work properly.

It is of interest to look behind all this modest back-patting and try to discover the real reason for the fine record of this theatre. And one need not look far for the answer, for it becomes apparent at once from reading the following description by Projectionist Newkirk of the staff on the routine followed in this theatre.

#### Inspection Routine

"Electrical Research Products recently printed in the bulletin *Erpi-gram* the record of the Missouri Theatre in St. Joseph, Missouri, in having run since August, 1928, without a shutdown and without requiring one emergency service call. This comment attracted considerable attention in projection circles, and we were pressed for details as to 'how we did it.' We of the staff at the Missouri saw nothing unusual about this record; but if everyone tells us it is something fine, why I suppose we shall have to oblige. Speaking for the staff, I should like to say that the 'secret of our success' (now that we are famous), lies in an inspection routine which we established when we first opened with sound.

"The equipment at the Missouri is the 2-SX, with 41-, 42-, and 43-A amplifiers. Continued checking of the equipment is the answer to freedom from interruption. Fortunately, we of the staff enjoy a fine spirit of co-operation between the local ERPI service staff, and we like to think that this relationship played a big part in compiling the record. The equipment is given a regular check once a week by the projection staff, in which every bit of equipment is gone over; and then every two weeks the ERPI service man makes an inspection. Daily inspection by the

house staff goes without saying, of course.

"We give the complete system a thorough inspection: — relays, switches, fader, gain, etc., are all cleaned with Carbona; tube bases and sockets are polished for perfect contact and are tested for defects in performance; the film pick-up, amplifiers, and p.e.c. units are thoroughly checked and cleaned weekly, and a minute check-up is made for loose connections. Daily checks are made for microphonic tubes. Incidentally, this particular system is very accessible and convenient for checking-up purposes.

"Of course, there have been times when we felt that the show just wouldn't go on—some particular thing would go awry and we would pass a few anxious moments. But it never did stop; and usually a hurried but efficient check, lasting but a minute or two, set things in order.

"Our crew has devoted much time to careful studying of the particular system we operate, and each individual unit of the system is thoroughly understood by each man. Particularly is this true with regard to the circuits. Such knowledge did not, we assure you, come easily; we had to grind through many hours to get it. But it has proven more than worthwhile.

#### Managerial Cooperation

"An average of ten hours per week is spent on inspecting and servicing the equipment. In this respect we have enjoyed the finest cooperation from the theatre management which only too gladly paid the necessary overtime. The record set up is sufficient indication that the theatre got its investment in this work back manifold, and, to our mind at least, justifies a reasonable expenditure by every theatre for this type of work. Without this extra time such a performance record could not have been established.

"Furthermore, no one-man sound shift can point to a similar record. Two men on a sound shift is absolutely necessary.

"In summing up, I should like to express the conviction of the staff that cleanliness in a projection room will help overcome many problems. Given a good equipment, properly manned and cared for, and that which we have done should become commonplace.

#### "All Quiet—" Adjudged Best in Nationwide Poll

Taking first place with the unprecedented vote of 271, giving it the wide margin of 104 over its nearest rival and representing the highest figure ever scored in this series of annual contests, "All Quiet on the Western Front" heads the list of winners in *The Film Daily's* poll for the "Ten Best Pictures of 1930."

The poll represents the opinions of motion picture critics on 293 individual daily newspapers, three syndicates serving about 450 additional papers, and 36 fan and trade publications, with an aggregate of more than 30,000,000 readers.

This year's vote was the largest to date, reflecting greatly increased interest in the poll. Further evidence of the enthusiasm that has grown up over the selection of the year's ten best pictures is shown in the fact that nearly 100 newspapers, magazines, organizations, etc., conducted "Ten Best" contests of their own. The idea also has been adopted abroad. Motion picture critics on some of the daily papers have submitted, as their list of ten best for *The Film Daily* poll, the selections made by a canvass of their readers. Thus the results announced in this contest represents the last analysis and the final essence of all selections. It is the best of all ten bests.

A special factor operating in favor of "All Quiet" was the great amount of controversy aroused by this picture in Europe. Germany banned it and several other countries immediately sought to follow suit. This kept "All Quiet" in the newspaper headlines almost consistently. The picture was produced by Universal and directed by Lewis Milestone from the best seller by Erich Maria Remarque. Among the principal players in the cast are Lewis Ayres, Louis Wolheim, John Wray and "Slim" Summerville.

#### TEN BEST PICTURES OF 1930

(*Film Daily's* national poll)

Picture	No. of Votes
All Quiet on the Western Front.	271
Abraham Lincoln .....	167
Holiday .....	166
Journey's End .....	151
Anna Christie .....	141
The Big House .....	141
With Byrd at the South Pole ...	121
The Divorcee .....	94
Hell's Angels .....	91
Old English .....	87



# Some Causes for Variations in the Light and Steadiness of High Intensity Carbons\*

By D. B. JOY and A. C. DOWNES

IT has been shown<sup>1, 2, 3, 4</sup> that the relative positions of the positive and negative carbons in the high intensity arc affect its behavior. This paper deals with the variations in the relative positions possible in commercial lamps where the angle formed by the axes of the two carbons is fixed. It will be shown that the rather minor variations have an unexpectedly large effect on the amount of light and the steadiness of the arc.

The results of these variations are common to all types of high intensity lamps and carbons, but the greater part of the work described here was done on 13.6 mm. positives with  $\frac{3}{8}$  in. copper-coated cored negative carbons at 120 amperes, unless otherwise specified. The angle of the axes of the carbons was 45 degrees.

It has been the practice for carbon manufacturers to specify the current at which high intensity carbons of various sizes should be burned, but they have been reluctant to specify the voltage. A glance at Fig. 1 will explain the reason for this reticence. This figure gives graphic representations of three 70-volt arcs, but the arc lengths, measured as shown in the figure, vary from  $1\frac{1}{2}$  in. to  $\frac{5}{8}$  in. In X the negative flame does not touch the lower part of the positive carbon; in Y it just touches it; and in Z it overlaps it considerably. These arcs give entirely different results in quantity and quality of crater light, and the projectionist would only be confused by any voltage specification without qualification as to the relative position of positive and negative carbon, and his latter relationship is probably more important than the arc voltage.

The most practical means of studying the results of the movement of the positive carbon with respect to

\* S. M. P. E. Trans., Vol. XVI (Jan., 1931), No. 1. Research Laboratories, National Carbon Co., Inc., Cleveland, Ohio.

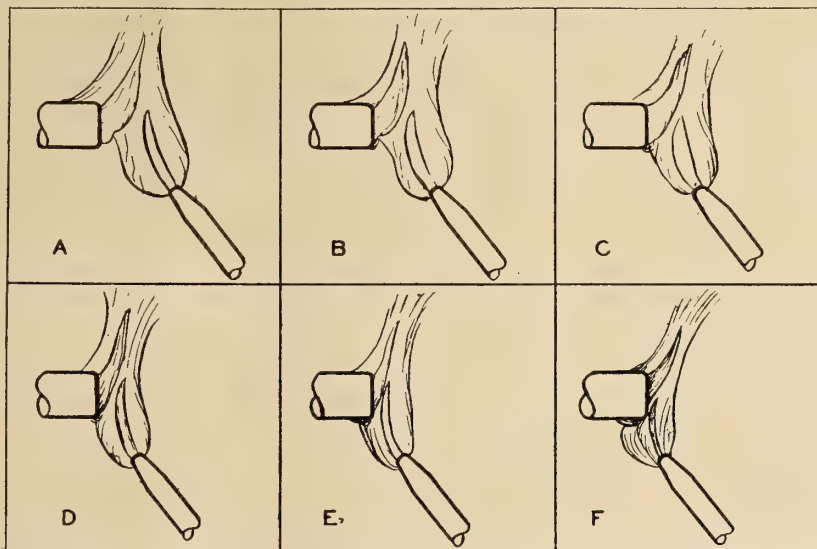


Figure 2

the negative is to hold the negative carbon tip in one position and move the positive carbon along its axis. Graphic representations of the arcs obtained at 120 amperes by moving the positive carbon successive steps of  $\frac{1}{8}$  in. along its axis are given in Fig. 2. The arc voltage for this particular set varies from 86 in position A to 55 volts in position F. The negative flame in position A in Fig. 2 is considerably ahead of the positive so that the positive flame actually rolls out of the bottom of the positive crater before the negative flame strikes it and diverts it upward.

As the positive carbon is moved ahead this condition is altered so that at D the edge of the negative flame just touches the lower edge of the positive carbon and practically the whole negative flame is sweeping across the crater opening as though compressing the positive flame. Finally at F a good portion of the

negative flame plays against the bottom of the positive carbon and again only a part sweeps across the positive crater. The values of relative light and arc voltage for these different arcs at 120 amperes are shown in Fig. 3. The maximum useful light is obtained at position D (as would be expected from the above description of the action of the negative flame against the positive crater opening). The light diminishes as the positive is moved in either direction from position D.

Unfortunately the position of maximum light is not the position of maximum steadiness. With the arc in position A, the direction of the positive flame from the crater is not stable, resulting in many large flickers in the crater or useful light. This condition is improved as the positive carbon is moved forward so that the large flickers decrease and are practically eliminated at positions C and D. In these positions small flickers of rather short duration are evident. The negative flame is either just hitting or just clearing the lower side of the positive carbon in these positions and tends to oscillate on and off the edge of the positive shell in a rapid movement causing medium sized flickers of short duration.

When the positive has been advanced to position E in Fig. 2 the edge of the negative flame is permanently on the bottom side of the positive shell and the negative flame drives against the positive arc stream with a steady force of uniform direction and magnitude so that there is

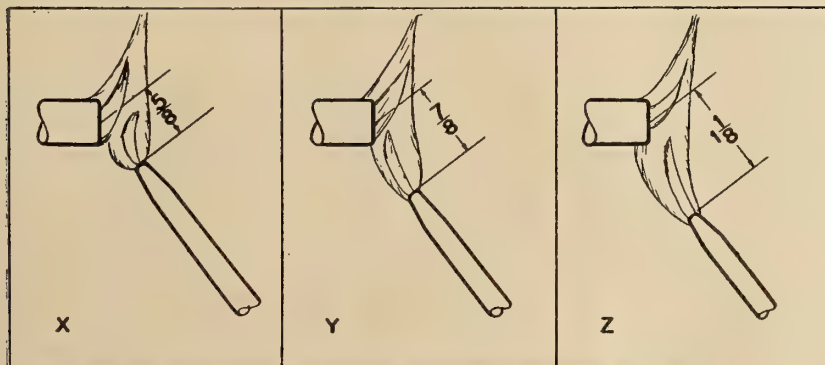


Figure 1



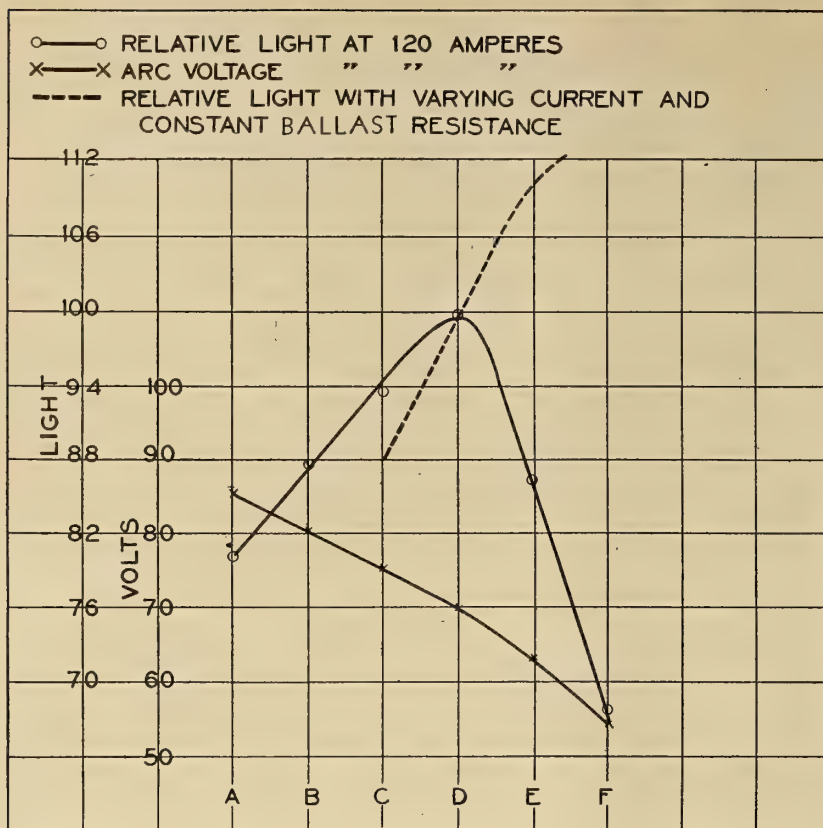


Figure 3

practically no flicker in the useful light from the arc. With the arc in this position, a high intensity spot lamp has been observed for half an hour at a time without detecting any noticeable flicker in the spot.

The light is lower as shown in Fig. 3 for this position than in position D where some flickering is obtained. The light is still lower in position F without any change in steadiness so that the optimum condition position is that in which the edge of the negative flame impinges on the positive carbon as close to the end as possible without noticeable flickering on the screen or in the spotlight.

If the positive carbon is changed C or D to that of E without changing the position of the negative or the ballast resistance, as is often done in the projection booth, there might actually be an increase in light with the elimination of practically all of the noticeable flicker. If the position is moved in the opposite direction toward position A the decrease of light will be much greater than that shown in the solid line of Fig. 3. This change is shown by the dotted line in Fig. 3 for a 115-volt power line. The reason for this is obvious when the decrease of voltage in going from A to F is noted. If the ballast resistance and line voltage were kept constant, a movement of the positive from position A to any of the other positions would necessarily give an increase in current.

The distance from the projected axis of the positive carbon to the tip

of the negative carbon for the arc illustrated in Fig. 2 is  $\frac{5}{8}$  in. Similar experiments were made with distances of  $\frac{1}{2}$  in. and  $\frac{3}{4}$  in., with exactly the same results. Within these limits and with the same relative position of the positive and negative flames the arc length had no noticeable effect on the useful light.

In the high intensity arc burning 16 mm. positives and 11 mm. plain cored negatives with an angle of 28 degrees between the carbon axes, it was found similarly that the position of maximum light was not that of maximum steadiness and that the edge of the negative flame definitely bathed the lower edge of the positive carbon when the light was most free from flickers.

#### Discussion

MR. BASSETT: I should like to congratulate Mr. Downes on this short paper with a lot of meat in it because it is the first time that one of the mysteries of the high intensity arc has been brought down to a concise explanation. Some operators can always get the best out of a high intensity arc, and this was considered a special knack. Any operator who will study this paper can acquire the knack and improve his projection.

MR. BENFORD: I think there is one point about that paper that might be stressed a little more and that is that it is not always wise to increase the current in order to get more light. When the electrode is over-loaded it is likely to smoke and the gas becomes extremely unstable. I have known of several cases where there is an actual

decrease in light after the current had been increased some 10 per cent over its rated value.

PRESIDENT CRABTREE: What are the probabilities of our getting a light source of greater brightness; also what is the temperature of the brightest source that you have been able to obtain as compared with the sun?

MR. BENFORD: The temperature of the high intensity current as measured by its color is some 5600°K., a brightness temperature which is comparable with that of the sun.

PRESIDENT CRABTREE: This is of importance in connection with large screen pictures with the present 35 mm. film with a very small aperture, we cannot get enough light through it to give a large screen having sufficient brightness. That is one of the unfortunate limitations of the use of 35 mm. film for the very large theatres.

13.6 mm. Carbons at 125 Amps.

MR. DOWNES: In the paper we presented last year, I think at Toronto, there were values given for the average intrinsic brilliancy of several high intensity arcs. The most efficient one is the 13.6 mm. arc at about 125 amperes when looked at from the point of view of high average intrinsic brilliancy. That particular one, as I remember it, is of the order of 820 candle-power per square millimeter of crater opening area. That is the highest of all the ordinary high intensity arcs. The super high intensity arc at about 250 amperes has a higher intrinsic brilliancy, say from 850 to 1200 candle-power per square millimeter with the sun at about 900. Attempts have been made to use this arc for motion picture projection but so far this seems impracticable as this arc tends to be unstable and is very difficult to handle. There is work going on in our laboratories in efforts to improve the figures, and we hope that we may be able to get something satisfactory for the large size pictures.

PRESIDENT CRABTREE: Yes, but what percentage increase of brightness over the present source are you hopeful of getting?

MR. DOWNES: To increase the intrinsic brilliancy and at the same time retain the necessary steadiness of operation is very difficult and efforts to do both have not been very successful so far. Probably slightly larger light sources of about the same intrinsic brilliancy as the present arcs can be used.

#### References:

<sup>1</sup>Joy and Downes: "Characteristics of High Intensity Arcs," *J. Soc. Mot. Pict. Eng.* XIV (March, 1930), No. 3.

<sup>2</sup>Benford: "The High Intensity Arc," *Trans. Soc. Mot. Pict. Eng.*, No. 24 (March, 1926).

<sup>3</sup>Bassett: "The High Power Arc in Motion Pictures," *Trans. Soc. Mot. Pict. Eng.*, No. 11 (1920).

<sup>4</sup>Bassett: "Electrochemistry of the High Intensity Arc," *Trans. Amer. Electrochem. Soc.*, 44 (1923).

#### Western Electric Installations

Western Electric Sound System installations, according to the latest report, total 7,489, of which 4,862 are in the United States and 2,627 in the foreign field. In addition there are 292 review room installations.



# Visual Fatigue and the Motion Picture

By DR. LUCIANO DE FEO

Director, International Educational Cinematographic Institute†

THE following study is essentially practical in character and scope. There has been much theoretical discussion on the different forms of fatigue that children sometimes experience after ordinary cinema performances, but such investigations and impressions were mostly the result of mere speculation and were based upon isolated cases too few in number to constitute a phenomenon.

It is important to consider the extent of a phenomenon before building up a theory upon it, and, in the enquiry with which we are concerned, to consider "cinema patients" in direct connection with ordinary films, that is, films projected in public theatres, films, in fact, which are the special target of those who would make the cinema responsible for all evil, but which are in reality capable of doing children and young people the greatest good as well as harm.

School films, owing to the special milieu in which they are shown and the special nature of such projections (short cultural or scientific films, sometimes containing a particular message or accompanied by the teacher's comments), would have elicited from the pupils opinions of very limited application, affording no general view of the cinema as a phenomenon.

Confined to school films, this inquiry would have failed in its purpose.

For the 27 Italian provinces covered by the enquiry, the results in regard to visual fatigue—expressed in actual figures and as percentages are shown in the accompanying table (Table 1).

Summed up, and without distinction of age and sex, the results are as follows: 5,627 children and young people, or 28.62% of the total number, normally experience visual fatigue after a cinematographic performance; 863, or 4.41%, experience this fatigue only occasionally, under certain conditions; 11,041, or 56.14%, state that they have never felt it; 2,310, or 10.83%, give no exact answer to the question asked.

If we include those who gave no definite answer among children who say they feel no visual fatigue as the result of the cinema, we are left with 33.03% who specifically acknowledge the existence, persistent or otherwise, of a *locus minoris resistentiae* in their visual organ subsequent to cinematographic projections.

## Opinions of Specialists

Before we analyse the causes of visual fatigue as shown in the replies of the children to our questionnaire, we may briefly summarize the views held by specialists whom the Institute has questioned on this matter.

Professor Arnaldo Angelucci, of Naples, honorary member of the International Association for the Prevention of Blindness, setting aside the special case of children whose sense organs are at the outset in an abnormal condition, bases his observations mainly upon the state of the cinematographic material (apparatus and films). In other words, films whose perforations are worn and projecting apparatus of which the rollers are worn, result in flicker during projection, and this may cause visual fatigue, apart from more serious consequences.

Professor Emile von Gross, of the Eye Clinic of the University of Budapest, agrees in principle with Prof. Angelucci that normally cinema projections are not dangerous to the eyesight of children and young people. He points out that as a rule school projections do not last for more than one or two hours and thus cannot cause injury or trouble of any kind to healthy and normal eyes.

Professor F. de Lapersonne, of the University of Paris and President of the International Association for the Prevention of Blindness, who has had long professional experience, is also of the opinion that the cinema can only be injurious to children's sight if the films are worn or damaged so as to produce flicker; or if the letters or captions are illegible or unsymmetrical; or when the spectator is too close to the screen. No single projection, he says, should last for more than ten minutes or a quarter of an hour; the eyes should be allowed to rest for two or three minutes between one projection and another. Finally, harm may be done if the child's sight is abnormal or if children suffering from any degree of ametropia are not supplied with proper spectacles.

Dr. Park Lewis of the University of Buffalo, vice-president of the International Association for the Prevention of Blindness, made a close study of this question and came to the following conclusions:

(a) A review of existing literature does not show that cinema projections have ever caused serious injury to the sight and reveals but few complaints of inconvenience. Under normal physiological conditions, therefore, moving pictures do not cause serious eye-fatigue;

(b) Since viewing motion pictures is distance vision, it does not demand so great an ocular effort as the observance of a near object;

(c) Although the eyes are strained by watching moving pictures, even in the best theatres, they are in all prob-

† Rome, Italy.

Age-Group	Visual Fatigue Experienced as a Rule			Experienced Occasionally		
	Boys and Girls			Boys and Girls		
	Boys	Girls	Girls	Boys	Girls	Girls
From 10-12 .....	2,299	1,852	4,151	317	207	524
(Expressed in percentage)	(30.30)	(32.87)	(31.40)	(4.18)	(3.67)	(3.96)
From 13-15 .....	678	299	977	103	43	146
(Expressed in percentage)	(22.99)	(25.38)	(23.67)	(3.19)	(3.65)	(3.54)
16 and over .....	423	76	499	172	21	193
(Expressed in percentage)	(22.94)	(19.80)	(21.59)	(8.94)	(5.47)	(8.34)
Total .....	3,400	2,227	5,627	592	271	863
						5,627
Grand total .....						6,490

Age-Group	No Visual Fatigue Felt at All			No Definite Answer		
	Boys and Girls			Boys and Girls		
	Boys	Girls	Girls	Boys	Girls	Girls
From 10-12 .....	4,084	2,734	6,818	888	842	1,730
(Expressed in percentage)	(53.82)	(48.52)	(51.56)	11.70	(14.94)	(13.08)
From 13-15 .....	1,937	721	2,658	230	115	345
(Expressed in percentage)	(65.92)	(61.21)	(64.43)	(7.90)	(9.76)	(8.36)
16 and over .....	1,286	279	1,565	47	8	55
(Expressed in percentage)	(66.67)	(72.65)	(67.69)	(2.45)	(2.08)	(2.38)
Total .....	7,307	3,734	11,041	1,165	965	2,130
						11,041
Grand total .....						13,171

Table I: Actual and percentage figures of survey results



ability damaged little more than they are by reading for the same length of time under ordinary conditions of lighting;

(d) Eye-strain caused by motion pictures is due to one or other of the following conditions, each of which is avoidable: prolonged concentration of the eye; defective eyesight; position of the observer in relation to the screen; poor film, bad manipulation, or faulty projection; faulty general illumination.

Professor Giuseppe Ovio, Director of the Eye Clinic of the University of Rome, mentioned as sources of possible injury to eyesight:—over-rapid projection; too frequent captions, these being also more subject to "flicker" than the pictures and being shown on over-light backgrounds; panoramic movements of the background, which easily produce giddiness and compel the eyes to unwonted and always tiring effort.

Professor Van der Hoeve, Director of the Eye Clinic of the University of Leyden, declared that the few instances of visual disturbance caused by the cinema that had come to his notice had occurred in very nervous subjects. He recommended that performances for children should not last too long and that the hall during projection should not be absolutely dark, so as to avoid the sudden change from the brightly-light screen to the darkness of the room, and *vice versa*.

The opinion of two experts working in different spheres, a teacher and an alienist, agree in the main with the views of the above specialists:

Signor Ettore Tosi, headmaster of a Government school in Rome, thinks that the retina and nerve centres are bound to be disturbed with every passage of a picture across the screen and he wonders whether beyond a certain point these disturbances are not calculated to produce a painful sensation similar to the effect, in the long run, of a drop of water falling continually upon the palm of the hand.

Dr. Fabio Pennacchi, of the Perugia Lunatic Asylum, in his article, "The Cinema and Adolescence," quoted the opinion of specialists that many young people had to thank their love of the cinema for the impairment of their sight—especially poor children, who occupy the cheapest seats nearest the screen: "It is true," wrote Dr. Pennacchi, "that in her writings Dr. Hein, a Danish lady oculist, inclines rather to blame the stress of school work for poor sight among children, but it cannot be denied that the speed of the impressions on the retina is a cause of marked ocular tension, complicated by difficulties of adjustment, especially with regard to the distance of the eye from the screen. Headache often ensues, sometimes giddiness; and, in the long run, the organ itself is weakened."

A book entitled "The Cinema. Its present position and future possibilities" (London, Williams and Norgate, 1917), giving summaries of the opinions of experts and of the conclusions

of enquiries instituted by specialists in the different branches of screen activity, contains observations relevant to our question. Although thirteen years old, these remarks do not substantially vary from those recently made by oculists, scientists and others specially concerned with the physical and moral protection of the young.

We should like to summarize here what was written in 1917 concerning visual fatigue as a consequence of cinema projections. Dr. Bishop Harman, Ophthalmic Surgeon to the West London Hospital and Belgrave Hospital for Children, attributed this fatigue to the following factors:

1. Glare.
2. Flicker.
3. Rapidity of Motion.
4. Concentration of Attention.
5. Duration of Exhibition.

These factors have the same effects upon children as upon the more impressionable adults, but owing to their lesser power of resistance, children succumb to fatigue more quickly.

1. *Glare*.—Projection rooms are made as dark as possible and all the

light is thrown upon a very white screen and therefrom reflected into the eyes of the observer. These necessary conditions of the show are the worst conditions for the eyes; they tend to produce the maximum of fatigue. Glare cannot be dissociated from the show, but it can be reduced by a suitable illumination of those parts of the hall removed from the screen and by moderate general lighting during the intervals.

2. *Flicker*.—This defect is generally due to bad films and is most evident in colored films. Technique, however, has greatly improved in this matter.

3. *Rapidity of Motion*.—This is connected with the previous defect, since in order to reduce flicker, the film is moved through the machine at a greater rate than that of the progress of the event depicted.

4. *The concentration of attention* required by the cinema is greater than that necessary to follow any other kind of show and engenders visual fatigue, especially in children. Since the eye does not take in the whole of a scene at once, it has to move rapidly from one point to another, and

## Exciter Lamp Performance

V. J. Roper

Nela Park Engineering Department, General Electric Company

**A**N article in the November issue of the MOTION PICTURE PROJECTIONIST entitled "A Few Facts About Your Exciter Lamps" has inspired a defense of the practice of operating exciter lamps at a current under their rated value to obtain longer life. A comment on this article stated that recent tests made by a special volume indicator show that frequency response (and therefore quality), is the same at a lower current value as at the rated lamp current, and that the only difference is one of output level.

While this is essentially true, and also that one may compensate for the lower output level by going up a notch or two on the fader, one should not overlook the effect of ground noise. The increased amplification naturally magnifies surface and ground noises and in this respect impairs quality.

The exciter lamp situation has been complicated somewhat by changes in the lamp design characteristics. The new 8½ volt, 4-ampere lamps used in Western Electric apparatus and all other equipments formerly employing lamps of 8-volt, 4-ampere rating, supplies higher light output to the photo-electric cells. This means that amplification can be reduced still further with a resultant further reduction in ground noise level. This new lamp was developed in response to a desire on

the part of sound engineers to obtain more light through the optical system. Since it was introduced for the major purpose of furnishing additional light, its very purpose is defeated by operating it far under the rated current. At 3.6 amperes,—a current reduction of 10 per cent,—mentioned as the operating current in the comment to which I refer, the light output is only 50 per cent of the light output at 4.0 amperes.

The same principle applies to the systems using the 10-volt, 5-ampere, and the 10-volt, 7.5-ampere lamps:—a three per cent reduction in current causes approximately a twenty per cent reduction in light output. Three per cent less current doesn't look like much on an ammeter, and perhaps it doesn't require much of a change of fader setting to compensate for the loss in volume, but it's a step in the wrong direction. It is easy to accuse the lamp manufacturers of having a selfish interest in desiring to have the lamps operate at their full current. But the sound equipment people wish the exciter lamp to give as much light as possible in order that the apparatus will function at its best. And those having the problem of theatre operation in mind will question the advisability of even slightly jeopardizing sound results in the interests of making a lamp last a few hours or days longer.



this demands an excessive and exhausting effort.

5. *Duration of exhibition.*—Cinema performances commonly last from one and a half to three hours. A child is not capable of sustained attention for so long. Shows should therefore be much shorter.

The effects of the cinema on children's eyes are only momentary and cannot have serious consequences unless attendance is assiduous. In any case, the best protection for the child will be secured by the following measures:

A. The reasonable illumination of all parts of the hall not directly beside the screen; B. The avoidance, as far as possible, of flicker and the withdrawal of damaged films; C. The improvement in taking the picture so as to bring the rate of motion of the objects depicted nearer to the natural; D. Increase in number and length of intervals; E. Limitation of shows for children to one hour; F. Reservation for children of the best places in the hall, that is, central positions as far away from the screen as twice its full height.

In contradiction to these conclusions, Dr. Saleeby, an English censor, who for four years has examined films on five days a week from 10 a. m. to 6 p. m., said that his eyes had never suffered. As Mr. Gaster points out, this statement is of very relative value, for in regard to fatigue in general and visual fatigue in particular, it is impossible to compare the resisting capacity of adults with that of organisms in the course of growth.

Mr. Leon Gaster, of the Illuminating Engineering Society, declared that:

1. In the darkened conditions of cinema theatres the eye is very sensitive to light and therefore no source brighter than the screen should fall within the angle of vision of the audience;

2. An excessive contrast between the bright screen and the dark surroundings is trying to the eyes. The walls and ceiling might therefore preferably be light in tint;

3. To avoid excessive contrast between light and shade, and also for safety, a small amount of light should be maintained in the room during projections. In the intervals, too, full lighting should be provided and should be gradually dimmed so as to avoid the shock to the eye of sudden transitions from darkness to brightness, and *vice versa*;

4. It is common knowledge that to be too near the screen is tiring to the eye. Children should therefore be given the best places and the front row should be at least twenty feet from the screen.

Such are the latest, most authoritative and direct indications with which science can furnish us on this matter. Let us now turn to the children and young people themselves, who, through the institute's enquiry, sup-

ply us with practical information on the causes of the trouble.

Taking the average for the 27 provinces, we find the highest proportion of those who normally or occasionally feel visual fatigue as the result of public cinema shows, among the youngest (under 12). The smaller localities report a larger proportion of eye-fatigue in young persons over 16, but as this age-group includes only 251 out of 4,912, the fact is of no great importance. It is of interest to note that in the big towns more children experience visual trouble than adolescents.

Let us now examine the causes of habitual fatigue or occasional fatigue as revealed by the Institute's enquiry. According to the statements of the subjects themselves, these are:

#### Causes of Visual Fatigue

(a) *Projection apparatus*: use of old and worn machines producing flicker; (b) *films*: damaged, worn or technically defective films, whether the defect is in the negative or in the printed copy; (c) *projection technique*: flicker due to too slow a motion or other reason; insufficient distance of observer from the screen; excessive speed with which the film is moved through the machine; if the film moves too quickly—about 10

children point out—the difficulty of following and discerning the stages of movement ends by tiring the eyes; bad projection technique in general is mentioned by many others; (d) *capacities*: these are complained of as being too numerous. About 100 school-children—mostly younger children and boys—say that the letters are too small and that they do not remain on the screen long enough: "We can't read them" is the gist of the complaint, "in spite of the fatiguing effort to read almost illegible writing in too short a time." (e) *lighting*: a large number complain of eye-fatigue caused by the lighting conditions of the hall during and between projections. Criticism is directed especially against the too sudden transition from the semi-darkness during projection to the bright illumination in the intervals and at the end of the performance; also against the excessive whiteness of the pictures and flicker—a fault of the projectionist—the result of an irregular distribution of the source of light during projection, dazzling to the eyes. (f) *seating arrangement of the theatre and the position of the observer in relation to the screen*: Hundreds of observations were made on this score, most, but not based upon economic considerations. Children go to the cinema either alone or in the company of friends or relatives. In the latter case, supposing the friend or relative has normal sight, the child will sit at a normal distance from the screen and the projection will not hurt his eyes. Often, however, the grownups accompanying children are short-sighted or can afford only the cheapest, i.e., the most crowded places, so that the child finds itself in the very front rows and close to the screen, where the defects of projection—flicker, dazzle, etc.—which are, as we know, more conspicuous near than from a distance, will be intensified and try the child's eyesight, however good it may be.

Children who go to the cinema alone are usually of the poor class. They have somehow collected the small sum required to obtain admission, but only enough to pay for the worst places at the local picture-house.

On this point the children's answers are often picturesque and illuminating: "How can I expect to see well," one said, "when I can only afford the front rows?" "My father is a working man and doesn't earn a great deal," is another answer. Two little boys wrote: "We are small, and always find ourselves behind taller people so that we have to crane our necks or shift our places, in order to see. The screen is often partly or altogether masked and one loses the thread. This is tiring and hurts the eyes." Others, for similar reasons, complain that in some cinemas the floor has not a sufficient slope.

An interesting feature is the complaint by many children and young people of the grown-up habit of smoking in halls which are frequently ill-ventilated: "Smoke," they say, "makes

### One-Man Sound Shifts

Editor, M. P. Projectionist.

Sir:—Referring to the editorial in your January issue "One-Man Sound Projection Shifts," in which you comment on the desire of theatre owners to have one man do work which properly should be apportioned between two men:—

This editorial has been read before this Local Union, and also before the local unit of the American Projection Society, and I am asked to compliment MOTION PICTURE PROJECTIONIST and its editor on this editorial as it goes straight to the point and offers the first really intelligent comment on this topic which has appeared. We have found that the claim has been set up that there is nothing which puts a theatre "in the red" except the salary of Projectionist No. 2. Rent and other expenses do not enter into it; and when exhibitors are asked if their film service bill has been reduced reply that it has . . . but they fail to admit that the reduction involves a much cheaper service.

So, we feel that your editorial was timely and one of the few truths expressed in this matter, and we desire to thank you for it.—W. G. Woods, Secretary, L. U. 162, San Francisco.



the eyes smart and prevents you seeing clearly."

Others mention further causes of visual fatigue of a purely subjective interest. The two categories of objection may be summarized as follows:

#### Undue Projection Length

1. *Undue length of projections:* Many children refer to the excessive length of films or parts of films, and of the short intervals between one part and another. They say that too long a projection often makes them giddy and, still more often, makes their eyes smart. Others add: "On coming out of the cinema after a long show, you can't see anything"; or again: "You see everything red and it's some while before the sight returns to normal." Others again: "It's alright at first, but in the long run the strain of watching becomes tiring." "The constant moving of the eyes, with no rest, tries the nerves and weakens the sight." "Over-long projections tire the eyes and make you sleepy."

#### 2. *Subjective elements.*

"If the scene is touching, you cry, and that hurts the eyes."

#### Short-sightedness.

"Evening shows are bad. In the daytime, you often open the windows or shutters in the intervals, and the light which enters does not hurt the eyes." "Boring scenes are tiring. For lack of other occupation, one looks at the screen and the eyes grow tired. The same applies to scenes indifferently acted."

(This latter remark is psychologically interesting. Mental weariness is not the only cause of boredom from projections. Psychic resistance leads by reflex action to visual fatigue.)

### Local 306 Dinner-Dance

The seventeenth annual dinner-dance of Local Union 306 was held in the Hotel Astor, New York City, on Saturday evening, January 17th. The affair was attended by more than 1,350 guests, among whom were leaders in civic, business and labor ranks. The grand ballroom of the Astor was crowded to capacity, and last-minute provision had to be made for accommodating the overflow of guests.

Honorary membership gold cards were presented by International President William F. Canavan, who acted as toastmaster, to Lieutenant-Governor Herbert H. Lehman of New York, to Sidney R. Kent, vice president and general manager of Paramount-Publix Corp.; to Major Albert Warner, of Warner Bros.; to Joseph J. Vogel, of Loews, Inc.; and to Fire Commissioner John J. Dorman of New York City. President Sam Kaplan of L. U. 306 expressed the pleasure of his organization in inducting these members.

The entire proceedings were broadcast by Station WMCA (N. Y.), which went on the air with the affair at 12:30 A. M. and didn't sign off until after 2 o'clock.

The entertainment provided was of a high order and included Rudy Vallee, Willie and Eugene Howard, Ethel Merman, Jack Pearl, Stanley Smith, and "N. T. G." and a group of his Hollywood Restaurant girls.

### S. M. P. E. Hollywood Meeting

The Spring meeting of the Society of Motion Picture Engineers will be held in Hollywood May 25th to 28th, according to announcement by W. C. Kunzmann following a recent meet-

ing of the Board of Governors. O. M. Glunt, Chairman of the Papers Committee has already begun work in securing representative speakers and papers for the meeting.

The last meeting to be held in Hollywood was in the Spring of 1928 and with so many new developments brought about by sound in the studios since then, the coming convention is expected to be of great interest and value to the members of the Society.

### Bausch Memorial Bridge

On New Year's day, the city of Rochester dedicated its newest and finest span across the Genessee river as the Bausch Memorial Bridge in honor of John Jacob Bausch, the founder of the Bausch & Lomb Optical Company. The tablet unveiled during the dedication exercises reads:

#### BAUSCH MEMORIAL BRIDGE

Erected 1930

BY THE CITY OF ROCHESTER

\* \*

By the will of the people a memorial to

JOHN JACOB BAUSCH

Pioneer manufacturer and industrial leader, who gave Rochester leadership in America's optical industry

In many ways this is regarded as a most fitting tribute. The first bridge to span the river at this point was built in 1873 and the following year the first company owned Bausch & Lomb plant was built immediately adjacent to it. The plant and the bridge have "grown up together" and it is a coincidence that the new Bausch Memorial bridge was built in the year that marked the 100th anniversary of the birth of John Jacob Bausch.



View of Hotel Astor grand ballroom during L. U. 306 Anniversary Party



# Recent Progress in Two-Way Television

By HERBERT E. IVES

*Director Electro-Optical Research, Bell Telephone Laboratories*

WHEN two-way television was demonstrated between the Bell Telephone Laboratories and the American Telephone and Telegraph building (N. Y.), in April of last year, certain improvements were incorporated in addition to the changes necessary to convert the earlier one-way into a two-way system. These have already been described.<sup>1</sup> Since that time still further improvements have been made, chiefly in the optical features, which make the received image quite appreciably more lifelike than it appeared with any of the earlier apparatus. These changes have in addition made the apparatus more compact and have contributed materially toward the ease of operation and upkeep of the system.

One of the modifications has been the substitution of an incandescent lamp for the arc formerly used for scanning. The mounting arrangement of the new light source, which is of the type used with motion picture projectors, is shown in the accompanying unnumbered general view. Several advantages are secured by this change. An incandescent lamp avoids the flickering always present to some extent in an arc and thus there is a gain in the steadiness of the image. Also, the maintenance and adjustment of the incandescent lamp, which is of the ordinary projection type, is much simpler. A still further advantage is that the filament, being at a lower



The two added caesium-oxygen cells are evident on either side of the opening through which the television image is seen.

temperature than the arc, radiates more light at the longer wave-lengths, which facilitates another improvement made in the scanning system.

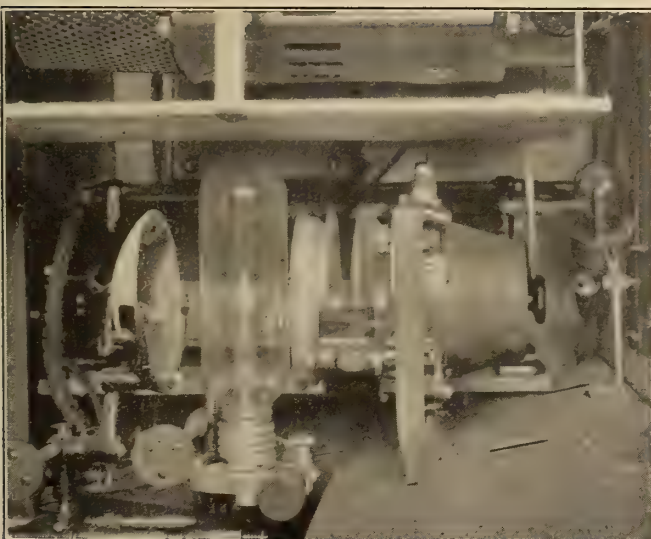
At the first two-way demonstration, the scanning beam traversed a filter that passed only blue light, and the photo-electric cells used, which were of the potassium-sulphur-vapor type, were sensitive chiefly to light in the blue part of the spectrum.

In the two-way system a person looks at the incoming image formed by the glow of a neon tube at the same

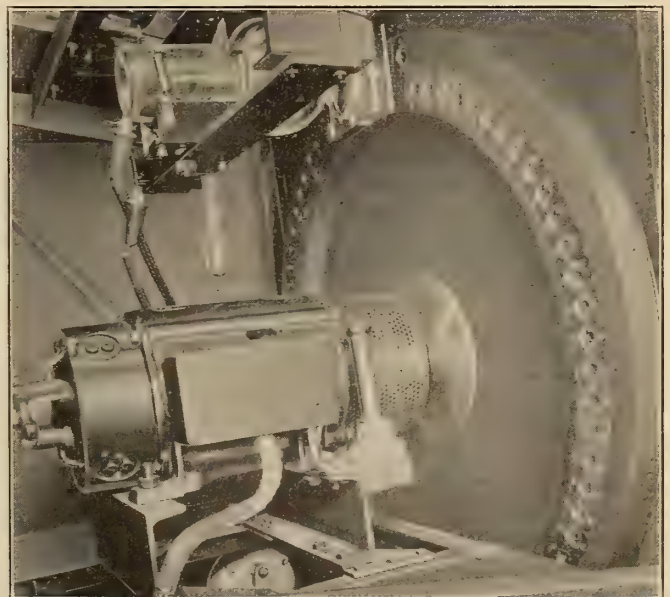
time that his face is being scanned for transmission to the other terminal. The luminous intensity of the neon tube is not high, and its effective brilliancy would be greatly decreased if the eye were exposed to a bright light from some other source. The human eye, however, is very insensitive to blue light, even when of quite high intensity, so that by making the scanning light blue it has only a very small effect on a person's ability to see the received image. The effect of using only blue light for scanning, however, was to make the yellows and reds in the face too dark in comparison with the whites, such as a linen collar, because very little blue light is reflected from yellowish or red surfaces.

## Obtain Orthochromatic Image

To secure greater naturalness in the image, a deep red component has now been incorporated in the scanning beam—making it purple instead of blue—and two photo-electric cells of the caesium-oxygen type have been added, which are very sensitive to red light. The result of scanning with light from both ends of the spectrum is to produce an image that is a much more faithful reproduction of the original. The effect is very much like that which would be obtained by scanning with light from the middle of the visible spectrum: an orthochromatic image is obtained and the definition of certain important points, such as



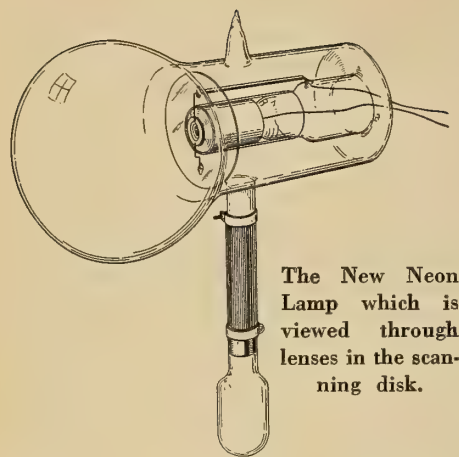
A high voltage incandescent lamp now takes the place of the cumbersome electric arc heretofore used in illuminating the image to be televised. This makes it possible to build a vision transmitter in about half the space as formerly required. This lamp, a recent development, is 900-watt, 2,000 candlepower.



New scanning disk for receiver which whirls eighteen times a second, making a complete picture at each revolution. Note seventy-two small lenses which play the incoming light impulses over the screen.

<sup>1</sup> Bell Laboratories Record—May, 1930, p. 399.





The New Neon Lamp which is viewed through lenses in the scanning disk.

the eyes, is a distinct improvement.

The two caesium-oxygen cells are mounted directly in front of the observer one on each side of the rectangular opening through which the incoming image is seen. These cells are only about half the size of the potassium cells, but because of their high sensitivity to light of long wavelength, and to the richness of the incandescent lamp in light at the red end of the spectrum, two of them are about as effective as the twelve potassium cells.

The caesium-oxygen cells, in addition to being highly sensitive to red, respond somewhat to yellow light, but deep purple filters are mounted in front of them so that only light in the red region is admitted to their active surfaces. The effect of the filters, used both with the scanning beam and with the caesium-oxygen cells, is to make the system completely unresponsive to yellow light, and advantage is taken of this to illuminate the booth with a yellow light of low intensity.

This light, while taking no part in the image transmission, prevents the scanning beam from being seen against too dark a background—thus further decreasing its effect on the eye—and also gives enough light in the room to enable the user to locate himself.

#### New Type Neon Tube

A third change that has been made is the provision of a new type of neon tube which has a considerably smaller electrode located farther back from the front of the bulb. The general appearance of the tube is shown. A lens mounted in front of the tube, together with lenses carried on the scanning disk, focus images of the glowing anode on each hole of the disk: a very efficient optical arrangement whereby the necessity of the large electrode area and high currents employed in the earlier tubes is avoided. The small aluminum anode is screwed into a large copper cylinder so that water cooling is not required, and the greater distance of the anode from the glass gives a longer life since the sputtering of the hot anode onto the glass surface is one of the factors that limits the effective life of the tube. The arrangement of tube and optical system is shown in the accompanying illustration.

These recent improvements represent no radical change in the system which in its essential features is the same as used previously. They are merely the results of studies which, as was stated at the original demonstration in 1927, would be indefinitely continued in line with the long established policy of the Bell System of developing all forms of communication which might be supplemental to the telephone.

group which may be called "indirect recording." This is not a form of dubbing at all, but since it is one purpose of this paper to dispel the illusion which many people seem to have, that most sound pictures are full of artificial and faked effects, it would be well to say some other words later on this subject also.

#### Straight Dubbing

Straight dubbing is the process of re-recording a sound record by re-converting the recorded vibrations into electrical vibrations and using these reproduced vibrations to make a new record. Straight dubbing may be subdivided into four groups:

- (1) Film to Disk
- (2) Film to Film
- (3) Disk to Film
- (4) Disk to Disk

In a studio, such as Paramount's, where all recording is originally done on film, film to disk dubbing is the most common form of straight dubbing. It is used only on completed features and short subjects, after they are ready for release, and is done for the purpose of making the product available to houses which are equipped for disk production only.

Straight dubbing from film to film is used only for the purpose of level and quality correction. It sometimes is found, when editing a film, that various sequences which were recorded at widely separated times, or by different monitor men, or which were subjected to different laboratory processings, do not match each other in level or quality. In such cases the faulty sequences can be re-recorded and the level changed or the quality corrected by the use of suitable equalizers. This form of dubbing becomes less and less necessary as the personnel of the studio and laboratory become more expert in their respective duties, but occasionally instances do arise where expensive retakes can be avoided by suitable dubbing from film to film. Level correction is made by simply raising or lowering the recording level of the dubbed record to what is considered the correct value. The level can be reduced to any desired point without difficulty, but in raising the level we are limited by the surface noise which is inherent in any form of recording. Quality correction is made by inserting suitable equalizers into the dubbing circuit. These will be discussed more fully later on. Film to film dubbing has its most important application in combined dubbing and synchronizing and will be discussed more fully under that heading.

#### Disk to Film Dubbing

Disk to film dubbing is comparatively rare; however, on one or two special occasions it has proved quite useful in this studio. Dubbing from ordinary pressings is not entirely satisfactory as the surface noise is somewhat high. Better results are obtained by dubbing from a metal mold, which has been chromium plated for

## The 'Dubbing' of Sound Pictures

By George Lewin\*

THE original meaning of the term "dubbing" as applied to sound pictures was simply the process of re-recording a sound record. The object of re-recording is usually to transform the record from one form to another, as from film to disk, or *vice versa*, or else simply re-record in the same form, for the purpose of changing the recorded level or frequency characteristic. But with the rapid development of sound pictures the meaning of the term "dubbing" broadened more and more, until at the present time, it is used rather loosely to describe any process whereby the original recording is modified in any way. It is also used to describe the process whereby foreign versions of domestic pictures are made by synchronizing foreign voices to the lip movements of the original version. This latter process is essentially a "faking" process, since, when viewing such a picture, the voices we hear are

not those of the original cast, but of an entirely different group of people. The same principle was used in some of the earlier domestic talking pictures in an effort to maintain the popularity of certain actors and actresses, whose speaking accents or singing voices would have been a disappointment to the film fans. So-called "voice doubles" were used to actually speak or sing while the player himself simply went through the lip motions. This form of faking, however, has been completely abandoned now and the public may rest assured that they are actually hearing the voices of their favorites, in all domestic releases.

For the purpose of discussion, dubbing may be classified into three broad groups:

- (1) Straight Dubbing.
- (2) Combined Dubbing and Synchronizing.
- (3) Dialog Dubbing.

To make the discussion complete it might be well to also add a fourth

\* Read at the S.M.P.E. Fall, 1930, meeting, New York.



the purpose. The surface noise from a chromium plated disk is about 6 db. lower than that of a regular pressing, for the same signal output, and there is also a noticeable improvement in the reproduction of high frequencies.

Straight dubbing from disk to film is done for release purposes by studios which record originally on disk. One or two special cases of disk to film dubbing are worthy of mention. One of these was where a certain musical selection which had been recorded on disk for the scoring of a feature picture was desired for a new feature on film. Rather than go to the expense of bringing in a full orchestra to make a new sound track, the selection was dubbed from the disk and served the same purpose. Another instance was where a silent picture, "The Silent Enemy," had been scored entirely on disk. The first reel of this picture had a spoken prologue which had been originally recorded on film and later dubbed into the disk. On releasing this picture for foreign countries the problem was encountered of making a new first reel disk which would contain the prologue in the language of the respective countries to which it would be released. The different languages had already been recorded on film. The problem was solved by dubbing the entire first reel from the disk onto the film. This film was in turn dubbed back to disk and as the spoken prologue started, the English version was turned off and the foreign version turned on. After the prologue finished we turned back to the music and completed the reel. It will be noted that the music on the completed first reel was therefore dubbed twice, from disk to film and then from film back to disk.

Disk to disk dubbing has practically no application in a studio which does all its original work on film. In a studio which records on disk, however, this form of dubbing is undoubtedly just as important as film to film dubbing in this studio.

#### Combined Dubbing and Synchronizing

Combined dubbing and synchronizing is by far the most important application of the re-recording principle. After a picture has been completed and is cut into its final form as regards action and dialog, we find that much still remains to be done before it is ready for release. We find, for instance, many dialog scenes which are supposedly occurring in places where we would expect various forms of background noise to be heard. For instance, the dialog may be taking place in a street, and we would naturally expect to hear the characteristic street noises in the background. Actually, of course, such scenes are, as a rule, recorded in the studio, without the background noises and it becomes necessary to put these sounds in after the picture is complete. This is accomplished by combined dubbing and synchronizing.

The question might be raised as to why such scenes are not recorded in their actual location, with the real background noises taking place during the actual shooting of the dialog. There are several answers to this question. In the first place, there are many locations which are often called for in stories, where it would be practically impossible to do combined recording and photographing.

For example, if we were walking along a crowded and noisy street, and were at the same time trying to hear the conversation of two people walking in back of us, we could probably do so without much difficulty, because our ears would automatically concentrate on what we were trying to hear and would reject all extraneous noises. A microphone, unfortunately is not capable of differentiating between what we are trying to record and the background noises, for it will pick up the latter with discouraging fidelity. In addition to this there is the difficulty of controlling crowds of curious onlookers and of placing cables and other sound equipment in locations where traffic is heavy. For similar reasons it would not be practical to do any recording on an actual train. It would be found that while the noise of the wheels striking the rails would seem natural enough to a person actually sitting in a train, it would sound all out of proportion to the dialog when heard in the theater.

All such scenes must therefore be recorded in the studio, using an artificial set, and any background noises which may be necessary are easily put in later by dubbing. They can then be controlled and made to sound just as we want them to. Other examples of sound effects best put in by dubbing, which are worthy of mention, are thunder and wind noise for storm scenes, the roar of cannon or gun shots for battle and fight scenes, the noise of passing trains and automobiles for indoor scenes where it is desired to convey the effect that outdoor noises are being heard.

The argument might be raised by those who advocate natural sound effects as opposed to artificial ones, that, granted it is impossible to successfully record natural sound effects together with the dialog in the actual location, we might at least record them in the studio while the actual dialog takes place. It should be pointed out in this connection that dubbing of all such characteristic noises rather than recording them together with the action, has an advantage not only as regards tone fidelity, but also from an economic standpoint. It is of great importance that a feature be completed in the shortest possible time. If production is delayed while the monitor man experiments with the balance between voices and sound effects, the cost of production mounts up rapidly. The working crew during the shooting of a feature picture usually consists of about forty people, and is composed

of directors, assistants, sound men, cameramen, electricians, and so forth, in addition to the players and extras, of whom there may be hundreds during some scenes. A dubbing crew for sound effects, on the other hand, consists at the most of ten or twelve men and they can in one or two working days synchronize a complete feature picture. By putting in the incidental effects after the picture is completed, considerably more time can be devoted and more pains taken to obtain the desired effects, at but a fraction of the cost.

Another important advantage of dubbing in sound effects is that stock sound tracks of these effects can be dubbed whenever necessary. This studio has a record of a thunderstorm which has stood in good stead in the dubbing of several pictures.

Incidental music is almost always dubbed in after the picture is completed. In many pictures there are sequences which can be rendered more effective by the addition of a background of appropriate music, which can either be played by an orchestra while the dialog is being re-recorded, or can be dubbed from previously recorded sound track. The present tendency is to avoid the use of music during the shooting of the picture wherever possible, as the presence of music in the sound track hampers the editing of a picture. Without music under the dialog it is possible to rearrange sequences, and make additions or omissions wherever desired when cutting the picture. This would be impossible, of course, if there were music in the track.

Straight musical sequences, however, such as songs or dance scenes, are usually recorded with an orchestra on the set. Attempts have been made in the past to economize on the use of orchestras during the shooting of such sequences, by having the artist sing or dance only to the accompaniment of a piano and drum, and then later dub a full orchestral accompaniment over this. This has not proved very successful, as it has been found difficult to keep the orchestra in exact time with the original track in dubbing, and even more important than this, it has been found that the artist usually does not perform with as much enthusiasm accompanied by piano and drum as he does with the aid of a full orchestra.

#### Technical Problems in Dubbing

We come now to a short discussion of the technical problems involved in dubbing. An ordinary recording channel is used, and the output of a projection machine is fed into one of the mixer positions on the monitor table. In the case of straight dubbing, this is all that is necessary, except for the addition of suitable equalizers, if they are required. In the case of combined dubbing and synchronizing, several projection machines or sound dubbing heads are fed into as many mixer

(Continued on page 44)



# Release Print Campaign Continues

**O**PINIONS on the new Standard Release Print continue to come in, but the passage of time serves to emphasize the differences of opinion within the craft on this system. There are many projectionists who accept the new print unreservedly; there are others who think the plan in general a good one, but who would like to see certain changes effected; while there is a third group which is absolutely opposed to the standard. This latter group comprises in the main all those projectionists who object to visual change-over signals. Audible signals are the preference of this latter group.

Among those who like the general idea of the new standard are many who think that the signal dots should be much smaller than at present. Also, the dots are held by this group to be too numerous and in the wrong position on the picture. The lower right hand corner is suggested as the preferred position for the dots.

Many projectionists have registered a complaint against this deliberate marking of the film as a change-over signal. For years past the tendency has been to advise against the marking of film as a means of effecting changeovers. The charge is made that the only difference between the new standard and the old punch mark is that the former provides a black background and is uniformly distributed.

## Council Committee Meeting

The Technical Co-ordination Committee of the Projection Advisory Council now has under consideration opinions on the print from projectionists throughout this country and in Canada. A careful study of these opinions will be made and careful consideration will be given to the views of both those in favor and those opposed to the new print. This work of sifting the various opinions will be done in cooperation with the Academy of Motion Picture Arts & Sciences, and the findings of this joint investigation will be forthcoming shortly.

On this special investigating committee of the Council are Sidney Burton, vice-president of the Council and president of A. P. S. No. 7; Herbert Griffin, International Projector Corp., and Harry Rubin, Supervisor of Projection for Publix Theatres. Griffin and Rubin will hold sessions in New York to which invitations to attend will be extended to leading projectionists in the East. In addition, all opinions which have come into the Council headquarters will be considered. Burton on the coast will conduct an independent survey of the Western territory and will serve as liaison man between the Council committee in the East and the Academy.

The work of organizing a group of

37 keymen to serve in their respective Film Board of Trade territories has progressed rapidly. Already acceptances have been received from 33 of the 37 districts, and the remaining posts will be filled shortly. The complete roster of these men will be announced just as soon as the roster is complete, probably on February 1st. This group of keymen will work with the secretaries of the various film boards of trade, and the activities of both groups will be supervised by both the Council and by the M. P. P. D. A. (Hays organization).

The duties of these keymen will be to observe general conditions in their territories pending the promulgation of the Technical Co-ordination Committee findings. As yet no definite plans have been evolved for the enforcement of the standard, the sponsors of the plan preferring to wait and see how the work develops. There are many projectionists of the opinion that some penalty, such as a charge for mutilated film, is necessary for a general observance of the standard, but neither the Council nor the Academy have seriously considered this step as yet.

## Academy Praises Projectionists

As soon as the report of the Council committee is ready, the 37 keymen will have their instructions as to how to proceed with the work in their districts. Further indication of the co-operative nature of the standard release print campaign is to be had in

Mr. P. A. McGuire,  
Executive Vice-President,  
Projection Advisory Council,  
New York City.

Dear Mr. McGuire:—

The Academy Producers-Technicians Committee, at its December meeting, took considerable time for discussion of the standard release print project. No feature of this progress has impressed us more than the splendidly constructive attitude the projectionists have taken through their Advisory Council. We are thoroughly convinced that this project is establishing contacts, and through contacts understanding, that will have a lasting significance in the motion picture industry.

On behalf of the Committee and the Academy, I want to express appreciation to the Council and to you and Mr. Barrows personally, for the whole-hearted and effective co-operation being given us.

Sincerely yours,

Irving Thalberg, Chairman,  
Producers-Technicians Com.  
Academy of M. P. Arts & Sciences

the fact that all 37 keymen will devote their time and work gratis.

At a recent special meeting of the Producers-Technicians Committee of the Academy the standard release print was discussed in detail and a report prepared showing the progress to date. Elsewhere on this page is reproduced a letter from Irving Thalberg, chairman of this committee, in which he expresses the appreciation of the producers for the splendid co-operation of projectionists on the release print plan.

More opinions on the S. R. P. are appended hereto:

—Bridgeton, N. J.—

Sir: I think that reels should be doubled-up and I know many others will agree with me. I don't see why the exchanges will not send out doubled-up reels. I guess the combination print is the cause. And speaking of combination prints, this is just another cause for a headache for many projectionists. It doesn't sound so well to have blank leader run past your sound light and it doesn't sound or look good for a disc to be behind a print.

Well, to get back to the Standard Print:—the black dots are the most objectionable feature about the whole plan. All these years the exchanges have been making plenty of noise about punches . . . now they help us out by putting them in for us. I think the click system could be used in place of the dots—the patron will not see anything to break the illusion of the story on the screen. Also a good cue-sheet would be much better than the dot system. The cue-sheet would have to be clear and not include a lot of unnecessary cues. The leader on the new release print is o. k.—the cue-sheet could, instead of the dots, be used with the new leader. The cues would have to be made at the same footage all the time, then the new leader could be used the same as now:—to find out the right footage for the in-coming projector after the cue is given.

Double-up the reels at the laboratory, use the click system or cue-sheet in place of the dots, and do away with combination prints. Until this is done there is little hope of ever getting in the clear.—John Bristol, Jr.

—New York City—

Sir:—In the Standard Release Print, there are many good things, but I and many other projectionists disapprove very much of the black spot cue changeover prints to date as the spot is so pronounced that the audience can plainly see every change-over. In the case of a letter title, etc., black spots flash as would a punch-hole in dark film and are very undesirable. These black spots really appear as though they were punch-holes in the negative, and it is just like changing the color of the old punch-hole from white to black, which we want to do away with. In the case of a dark scene, the white circles



around the black spot is also too pronounced. In short, instead of making punch-holes with white light to show on the screen we are making punch-holes cutting off the light.

Last week, one of the new prints we ran with the black spot cue marks certainly convinced us how the projectionists who ran it ahead of us liked it, as there were all sorts of scratches, holes, strips of dark film, etc., on same, which showed us that the black spots were not used, or if so, they are not in the proper place for those who ran this picture.

#### How About Shorts?

There are many projectionists who dislike turning down machines after they are threaded to a specified number of turns, and as some reels run very small (Part 8 of "Bride of the Regiment," 296 ft., Disc.), they do not always have time for this. Then again, the article makes me think of features only: Now, how about making changeovers on short subjects? Nothing is said about this and a good projectionist certainly wants to make these perfect also. Some reels have a large amount of music, while the end shows on the screen; others have none. Movietone usually has some notes of music abruptly cut off on the end by the insertion of the license number, which also is very objectionable.

If they insist on using these spots, why not use one instead of four, as the alert projectionist, that you speak of, certainly will be able to see the one, and the duration of the spot will be much shorter.

#### Spots Too Large

These spots show in our theatre about a foot and a half in diameter; entirely too large! A suggestion would be to put these spots in either the extreme lower left hand or right hand corner, as they would not be so pronounced there; and make them much smaller, say, one-third the size.

I would also like to say that if some of these gentlemen whose names were mentioned in the article, would work in a projection room with projectionists, not on Broadway, they would find matters somewhat different, as these boys run continuous shows and change them every few days, and have to contend with all sorts of obstacles.—William E. Cox.

#### Bridgeport, Conn.

Sir:—We have considered the problem of Standard film changeovers at a

special meeting of Local 277 of Bridgeport, Conn. The criticism of each member is identical. It is as follows:

They find the footage marking at the beginning of reel to be very helpful. They are perfectly satisfied with this. However, when one prepared to changeover from one machine to another you might accidentally blink your eyes. For example if you are preparing to change from No. 1 reel to No. 2 reel, you are staring through the porthole awaiting the marking on the film. If, however, you blink your eyes, you consequently miss the cue and have an interruption. We suggest as a remedy for this imperfection, that you put a click on the films so as to give sufficient warning as when to start the machine. In this way if you fail to see cue on the film, it will be possible for you to perceive it by ear.—Edward F. Lavery, Secty. L. U. 277.

#### Glendale, Calif.

Sir:—Regarding the Standard Release Print, which I have been following up very carefully, I have a suggestion to make which I think would be worth considering. The Print now is very noticeable to patrons in the theatre. It appears as an eye winking slowly and is very noticeable. My ideas of changeovers are such as no one knows where they are made. Now, if a small line  $\frac{1}{8}$ " long and  $\frac{1}{16}$ " wide be made at the upper right hand corner of two frames instead of four frames spaced  $\frac{1}{8}$ " from side of picture and  $\frac{1}{8}$ " from top of picture to allow for proportional aperture plates, and outlined as they are on the circles now used.

It should also be understood by all projectionists, that no Standard Print should be cut or doubled up, as in the minds of some who are still in doubt, and worrying whether they will be able to double or not. The Standard Print is the only thing for motion picture projection, but let's get together so no one sees the cues but the projectionist, who is watching for them.—E. S. Ives.

#### Pittsburgh, Penn.

Sir:—To be of any real value, the new Standard Release Print must be kept standard. I recently received a S. R. P. on which quite a few of the turndown footage numbers were missing; also on one reel the changeover

signals could not be found. Thus far I haven't received a single standard print which had the bands marked on it according to specifications. This doesn't help matters any. I have often wondered why so many reels begin and end in such haphazard fashion. Why is the dialogue often on the first foot of an incoming reel? Why does a reel end in the middle of a song? Why cannot all significant sound, especially music, be kept at least a few feet from the end and the beginning of each reel?

I recently ran a S. R. P. in which all the reels began and ended on fades. In the beginning of every fade-in there was inserted a foot of blank leader, which made a perfect changeover impossible. I did not changeover until the blank film went through, and luckily there was no sound on the first foot. Another one of these combination prints, so what can one expect. I like the S. R. P. in general, but its one chance of success is that it be kept standard and that mutilation be prevented. I do think an improvement could be wrought by making the marks smaller and putting them at the bottom of the picture. Perhaps if there were two clicks, always spaced the same distance apart, for each cue, there would be less chance of making a mistake. An audible as well as a visual cue is desirable.

One thing the S. R. P. has done is to arouse the industry to the necessity for improving reproduction. Personally, I think it a fine thing, for I have never seen so many letters from projectionists on any subject.—John H. Weaver,

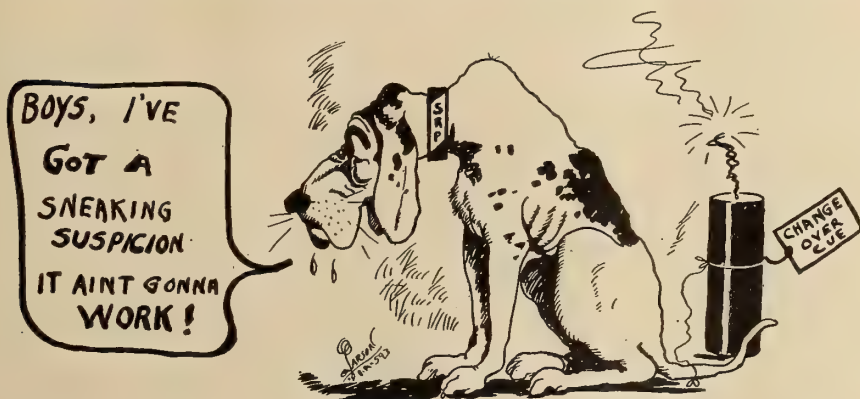
#### Fort Plain, N. Y.

Sir:—I am in favor of the Standard Release Print. Let's have fade-ins and fade-outs. Let's do away with combination prints. The big houses do not want disc prints at all; so why should the smaller houses be forced to take them? Let's do away with the so-called "squeeze" sound track which M-G-M is sponsoring. Two thousand foot film lengths are an absolute necessity for running a good show, and they will also help materially in reducing film mutilation.

Of course, there are some features of the S. R. P. which do not appeal to projectionists, but the chances are that these few wrinkles will be ironed out within a very short time. If only the new print can be kept standard, if all the markings are put in according to specifications, and if some system is devised for enforcing the general plan, I am sure that this print will work out satisfactorily.—Edmund Burke.

#### Newark, N. J.

Sir:—In one of your issues you asked for opinions on the new change-over marks. I have read a lot on the subject and agree with a lot of it. In the first place are they "standard"? I ask this as I find two companies' films different, namely, M. G. M. and Paramount. M. G. M., for instance—after the change-over cue there is always five feet of the picture left except where it is a F. O. Also, on its incoming signal there is a break for the projectionist as it gives one five feet of picture before



Submitted by P. L. Thomas, Creston, Iowa



talk or music. Paramount, on the other hand, has the change-over cue about 14 frames from the blank leader, and talk or music right up to change-over cue, and it is always some snappy fader change-over. Incoming you will nine times out of ten find talk or music 14 or 15 frames ahead of the picture on the blank leader. Did you say "standard"? And try to leave Starting Mark in aperture plate and see if it will be a perfect change-over. You must take off turns; why should this be?

About the marks in general, we as projectionists have preached for the last fifteen years or more that there should be no foreign marks on the screen at any time, and along came "WHO" (?) and puts plenty marks in the film. And about not being noticeable to the patrons, I have had any number of my friends ask me what are those round black marks you see every once in a while. As a whole I personally consider it a backward movement. I like the small piece of transparent film used as a click. We have had no trouble with this system of change-over. I like a change-over like this: . . . S. M. . . . CLICK . . . C. O. . . . F. O. of picture. —*Vincent A. Schauler.*

#### —Creston, Iowa—

Sir:—Regarding the Standard Release Print, I should like to state that the idea of a "Standard" is an extremely important step forward, a condition long ago needed by the industry. I regret, however, that such a stupid system should be recommended and adopted and I accept this opportunity to voice objection to any system using visual signals or markings on prints for change-overs. The punch and scratch mark evil will continue to exist so long as the industry tolerates certain types of cheap exhibitors who prefer bums, boobs, slobs and saps to OPERATE in their theatres, granting that such operating is painless and without the aid of the knife. The Producers placing visual signal marks on their own property will in my belief set up a condition resulting in greater abuses than existed heretofore. Today we are using an M. G. M. picture correctly marked with the new "round dot" signals, thus permitting perfect change-overs; however it is apparent that a great many Operators or Projectionists prefer to do their own marking and with no regard to destruction of the print or its mutilated appearance on the screen.

My recommendations are to eliminate the round dots entirely, substituting an accurate cue sheet conforming to the S. R. P. using "spoken word" or "descriptive action" for cues. Following the first showing cues are generally executed from memory and seldom is it necessary to refer the second time to the cue sheet or anything else, so why have those damnable, obnoxious signal marks at every reel-end, whether it be round dots or other types of distracting signals?

The greatest problem as I see it regarding any system or Standard for make-up of Prints will be maintaining such standard. Perhaps it is a little early and a bit too radical to suggest at this time that Exchanges inaugurate "a new policy" of rigid but first-class inspection, making a charge

against Theatres returning prints with evidence of punching, scratching, marking or doubling-up of reels. Exhibitors would have to pay and perhaps learn to regard their Projection-Room as the most important thing in their theatres. That's a big order but there will naturally have to be some cheese in the trap before the old house is rid of mice, maybe rats, too.—*P. E. Thomas.*

#### —Enid, Oklahoma—

Sir:—After running several of the Standard Release Prints and reading the opinions in the PROJECTIONIST, I believe the question has been covered very well on both sides, so there is not much left for anyone to say for or against the question. But that black dot does look bad as it is now used. I think a very good idea is started and hope it develops into something better, that doesn't look as bad on the screen. Some mark or some kind of a cue will be sent in by someone that will not be noticed by the audience.

As to the scratches, punch holes and various other kinds of marks put on film by others to be used for motor cues and changeovers, they look terrible. And I believe all this practice is as much the manager's fault as it is the one who puts it there. Why does he permit his projectionist to damage film like that? Why should not all the exchanges send letters to the managers to inform their projectionists about marking their film and the first one that came back so marked, send out a bill. (And I don't think a bill will even stop some of them if the manager permits it to continue.)

After seeing a Standard Release Print scratched along by the black dots I don't think anything can be used to stop them from scratching the film. If a fellow can't see those black dots he can't see any other cue that might be used.—*George L. McCann.*

#### —Columbia, S. C.—

Sir:—I have had the pleasure of running several prints with the "famous" dot changeover signal and would like to state that it is the best thing in that line thus far. It is much better than scratch marks, paper stickers, or punch marks, and I really don't believe it is noticeable by an audience. Since our theatres run first-run stuff, I can't say how the S. R. P. shapes up on subsequent runs, after it has been cut or made up again.

I do know, however, that it would be much better for exchanges to send out film on 2,000-foot lengths. This practice would not only reduce print costs, but would decrease the number of changeovers. When one makes from 8 to 12 changeovers on one show, there is always the probability of a slip.—*Shaler T. Stanley.*

#### —Johnstown, Ohio—

Sir:—I am certainly glad to see the "Standard Release Print" and I wish to thank everybody who had any part in bringing it about, but I believe it could be improved by numbering the frames between the foot numbers from 1 to 15, skipping the diamond, and putting a diamond on each frame using numbers about half the size of the foot numbers. That would elimi-

nate having to turn the projector down from a foot number to the correct frame for starting, as the projector could then be threaded on the correct frame and the sound start would always be right. For instance, if a certain machine started on 8 ft. and 7 frames of film, it would be plain to see the correct frame for picture start and the sound start would be on the 11th frame in the foot below. Or if a certain machine started on 9 ft., 4 frames of film, the picture start would be on the large diamond and the sound start would be on the 8th frame in the foot below.

When reels are short the projectionist does not always have time to thread the machine on a foot number and then turn down to the correct frame or he may very easily forget to turn down so if the frames in the foot were numbered it would be necessary to turn down.

I hope that you will use your influence and try to have the Standard used on Shorts as well as Features. I think the signals should be used on "The End" of shorts, then changeovers could be made from one subject to another in the same manner as changeovers from one reel to another in Features. I have just recently had 2 shorts that had the Standard Leader, but they didn't have the signals on "The End" and one Feature had a 10-foot interval between signals instead of 11 ft.; and another feature had been doubled-up before it got to me, but I believe the practice of doubling would end after a short while if the men doing it were notified that it will not be allowed. The position and size of signals and distance between them suit me, although they may show up pretty large on the larger screens, on the small screens they are not too large, so I am in favor of having the present size.—*R. L. Scovell.*

### New Absorbing Plaster

To be used as a finish coat for walls and ceiling, a new scientific acoustic plaster has been developed by Keasbey and Mattison, which, in addition to being especially easy to apply combines sound absorption and meritorious structural qualities.

It is known and marketed as the Ambler Sound Absorbing Plaster and will reduce excessive reverberation and confusion of sound, and, by its application to a sufficient surface, gives those acceptable periods of reverberation productive of correct acoustical effect.

#### Highly Efficient Absorbent

Its use will assure sound absorption of at least five times the effect obtainable with ordinary plaster, yet it has sufficient reflecting value to prevent a "dead" room, even though applied to all available plaster areas. It does not supplant ordinary plaster, but takes the place of the top or finish coat. It may be applied over gypsum plaster, lime and sand plaster, or on concrete.

The plaster can be made to produce a flat semi-smooth surface with a uniform or varied texture, as desired.



## New Equipment and Appliances

### RCA Develops New Type of "Ribbon Microphone"

Perfection of a new type of microphone, in process of development for the past several months and successfully operated in studios which employ the RCA Photophone system of recording, is announced by Lowell V. Calvert, manager of recording operations. The new device, which marks a revolutionary step in the transference of sound to film and which is known as the "Ribbon Microphone," was developed by Dr. Harry F. Olson, research engineer, who specializes in loud speaker and microphone operations.

"Many difficulties heretofore experienced in the recording of sound motion pictures have been solved by the use of the 'Ribbon Microphone,'" said Mr. Calvert. "Among other revolutionary virtues, it has what are known as 'directional sound pickup' characteristics, by virtue of which sounds coming only from certain directions are picked up, and sounds coming from other directions are completely ignored. This enables the microphone to be used in reverberant sets in such a way as to pick up the voices of the actors and at the same time considerably reduce the amount of reverberation picked up. Another way in which it can be used is to pick up an actor's voice and at the same time ignore the noise of the camera. Up to the present, bulky and inconvenient hoods or 'blimps' have been used over cameras, in order to reduce the noise picked up by the microphones. These clumsy incumbrances are now obsolete."

#### Principle of Operation

"The principle on which the 'ribbon microphone' operates is that of induction of electric current in an extremely thin and light corrugated aluminum ribbon, placed between the poles of an electro-magnet. This aluminum ribbon is only one ten thousandth of an inch thick, 3/16" wide and 2" long. The minute changes in air pressure occasioned by sound waves cause this ribbon to flutter or vibrate between the magnet poles, and electric currents are thereby set up in it. These currents are led to a transformer, which is connected to a vacuum tube amplifier of the conventional type.

"The 'ribbon microphone' proper is contained in a perforated box. The output of the microphone is fed to an amplifier. A plug and cable located

at the top of the amplifier runs to a standard recording amplifier. Its efficiency of pickup is the greatest in the directional normal to the face of the microphone. Its reception in the plane of the face of the microphone is zero. Thus if objectionable noises such as a camera are placed in this plane this noise will not be picked up by the microphone.

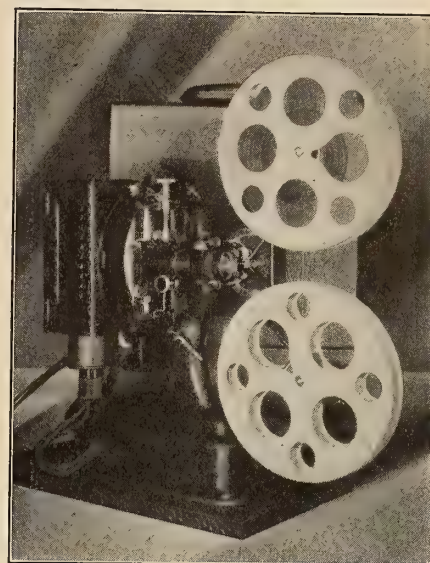
"Until this new device was developed, the only microphones used in motion picture studios have been of the so-called 'condenser-transmitter' type. These microphones have often been a source of considerable maintenance difficulty, because of their complicated construction and liability to leakage in damp weather. The 'Ribbon Microphone' is extremely simple in construction and much easier to maintain. It is expected that all licensees of RCA Photophone recording equipment will use the new device as soon as deliveries can be made to the studios."

### New Victor 16 mm. Projector for 250-Watt, 20-Volt Lamp

With the almost universal adoption of 16 mm. film and motion picture projectors for practically all non-theatrical uses, intense screen illumination has become a feature of vital importance in the more highly developed equipments. Lamp manufacturers have expended every effort toward devising a projection lamp of the greatest possible efficiency, and the latest accomplishment in this direction is the 250-watt, 20-volt, T-10 size lamp which was recently placed on the market. This low voltage lamp can, however, be satisfactorily used only in connection with a special transformer for 100-120 volt, 50-60 cycle A. C. operation.

The new model 3-G Victor Cine-Projector has a special transformer built into the base which permits the 250-watt, 20-volt lamp to be used with the utmost efficiency and with maximum lamp life.

To provide for use of the 3-G projector in communities where 50-60 cycle A. C. is not available, a "change-over" system of wiring has been utilized which permits the transformer to be cut out by removing one attachment plug and changing the location of another. The projector may then be operated on any 100-130 volt direct or alternating current. The No. 10 Victor lamp rheostat may also



Victor 3-G 16 mm. Projector

be attached to permit the use of the 165-watt, 30-volt high intensity lamp. Another feature of the model 3-G is a highly perfected optical system which utilizes as much as possible of the light emitted by the source.

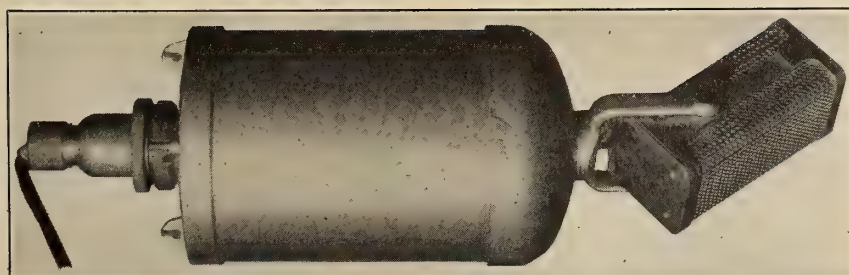
Mechanically the 3-G projector is identical to the well-known model 3, which embodies the following features: perpetual safeguarding against "jumpy" pictures; positive film protection, protective ever-dependable double claw film movement, framer for accurate centering, rack-and-pinion focusing, highly developed optical system, direct gear drive (no belts), with clutch control, extreme quietness, built-in rewind for automatic rewinding of one film while another is being shown, reverse action for running film backward, and stop-action for "still" projection.

### Strong Remote Volume Control

Theatre owners and managers who have long lamented their inability to control the volume and quality of their talking picture projection at the point of delivery will be pleased to learn that another knotty sound problem has been solved. A new device known as the Strong Remote Volume Control has put in its appearance and its announcement is meeting with an open-arm reception in every sound house whose management is concerned about the tone of voice of his programs.

L. D. Strong, of the Essannay Electric Manufacturing Company in Chicago, is the patentee and his company is now busy turning out the device for all RCA installations, RCA having been the first to give the device unqualified approval and sanction.

Exhibitors have long wondered why some inventive mind had not devised a means of regulating the volume remotely from a downstairs point, for, after all, that is the only section of



New RCA "ribbon" type microphone



the theatre from which sound reception can be safely judged. Certainly the projectionist in the projection room cannot determine if and when more or less volume of sound is needed to please the patrons. His monitor horn tells him only that there is sound emanating from the screen. The quality of the reception is not within his power of determination.

But with remote control from downstairs points, the manager or some attendant delegated to do so may not only regulate accurately the quantity of sound volume but the quality as well, actually "playing the picture," giving it the proper touch and tone for every set or scene, just as the producer intended the exhibition should be made.

While several remote stations may be installed, located at as many points in the house as desired, one station is usually sufficient, this located at the rear of the seats in the auditorium. An inconspicuous double toggle switch with "up" and "down" positions marked enables one to instantly regulate the volume, step by step, up or down as desired. And further, the device does not in any manner interfere with the work of the projectionist who still retains his same means of control and operation.

It is pointed out that buzzer signals, cue sheets, telephone calls and other methods heretofore employed in trying to direct the sound reception from downstairs may be dispensed with when the new system is installed. The manager directly controls the sound of his program with the new device which does not in any way interfere with the work of the projectionist.

Installations are now being made in RCA equipped theatres and, according to Mr. Strong, within a very short time the devices will be ready for adaptation to all other makes of sound equipment amplifiers.

### Fundamentals of Television

The scanning disc is a vital element in present-day television broadcasting and reception. Its action is extremely interesting. The disc is made of metal, as a rule, and is thin and rigid, a foot or more in diameter. There is a spirally located series of tiny holes drilled through the disc, and the disc is rotated by an electric motor which must be maintained at exactly the same speed as the corresponding motor at the broadcasting station.

The holes are placed a certain distance apart horizontally, that is, in the direction of rotation, and also a certain distance apart vertically, that is, toward the center of the disc. The horizontal distance between the holes determines the width of the picture, usually about  $1\frac{1}{4}$  inches. The holes are spaced apart vertically a distance equal to the diameter of the hole. (usually very slightly less).

#### The Scanning Disc

In back of the disc we have a neon tube which blinks bright and dim in accordance with the impulses from the transmitting station. In front of the disc we have a small ground glass screen on which we view the images.

The disc passes between, so that no light from the neon tube may reach the screen except through a hole in the disc. And only one hole at a time can be between the bulb and the screen. The top hole traces its path along the top of the screen, and during this brief passage, the neon tube may brighten and dim a number of times, making flashes of light at different places along the path of this hole.

Next comes the second hole, starting its quick trip across the picture just as the first hole leaves at the other side. Again the neon bulb flashes up and off, sending further shots of light. Each hole in succession traces its path, each path slightly lower down than its predecessor, until all the holes have passed and "swept" the picture complete.

#### Persistence of Vision

Your eye retains the image of each flash of light some time after it has gone. This is known as persistence of vision. The whole process occurs a number of times every second, perhaps ten times or more. The eye does not realize that the light flashes which compose themselves together really come only one at a time in a series of flashes. The eye sees the complete picture. If there are only twenty-four holes in the disc, the picture is less detailed, but the neon tube does not have to respond so fast. When wider bands are allowed for television purposes, larger and better pictures may be transmitted.

Naturally, the accuracy of speed control is highly important, for the picture would break up into a meaningless jumble of distorted light and dark spots should the disc get out of synchronism with that in the television broadcasting station. Hence the best drive for the disc is a synchronous motor, with mechanical braking device as second choice.

### A. P. S. Chap. 7 Holds Annual Frolic in Hollywood

Tuesday, Dec. 16, or rather, Wednesday morning, Dec. 17, saw one of the most interesting events in the Hollywood film colony's social activities, when the American Projection Society, California Chapter No. 7, of Los Angeles, entertained at its second annual dinner dance and frolic. The affair took place in the Elks' Temple, at Sixth and Park View. The great ballroom, specially decorated for the occasion, was given a modernistic aspect through the use of unique lighting effects, shifting color combinations and odd effects, designed after the fashion of the theatre and being used to enhance the effectiveness of the decorations.

The frolic was informal in nature. Gene Morgan, famous master of ceremonies in movie houses, acted in a like capacity and introduced the acts, as well as Miss Raquel Torres, heroine of "White Shadows of the South Seas," who made the presentations.

The recent celebration and dinner dance marks the completion of one of the most active years in the history of the society, with many developments in sound projection having been studied and investigated.

The dinner dance was handled by a committee headed by Otto Felts, assisted by "Chuck" Fowler and Louis Wutke.

The affair incidentally aided in welcoming the newly-elected officers of the chapter: Sydney Burton, president; Fred L. Borch, secretary, and Harry Cage, treasurer. This is Burton's third term as president. The retiring officers are: Vice President J. B. Kenton, Secretary D. H. Koskoff, Treasurer Al Feinstein, Sergeant-at-Arms D. B. Levitt, Board of Governors A. C. Schroeder, Wallace G. Crowley.

### H. & S. Solderless Lug

Up to the present time the connecting of the lead wires to rheostats for motion picture projectors has been a source of general annoyance, both to projectionists and electricians, and very often the contacts effected were of a necessity faulty. This trouble has been due to the large variation in the sizes of wires used on the different installations, particularly now when rheostats of higher amperage are being installed.

In view of this condition, Hoffman & Soons, makers of the Perfection rheostat, have developed a new type solderless lug which has solved this vexing problem. These lugs are of extra heavy construction, are adjustable and will accommodate any size wire from No. 4 B & S to a No. 4/0 B & S with equal efficiency. An added feature is the supports which prevent the lugs from turning and becoming loose. These new lugs are now being installed on all H. & S. Perfection rheostats.

These lugs are adjudged to be the best adjustable lug yet developed. They are now available at all dealers.

### Series and Parallel

Dry cells used in battery sets illustrate series and parallel connections nicely. Dry cells are used to light the filaments of dry cell type radio sets. With tubes like the 199, three dry cells in series are required. The voltage is then tripled (each cell is  $1\frac{1}{2}$  volts; total is therefore  $4\frac{1}{2}$  volts). The current capacity of the cell remains the same as that of one cell, however. For other tubes, such as the WD11, only  $1\frac{1}{2}$  volts are required, but one cell does not have enough current capacity to light all the tubes of the set. Therefore a number of dry cells, any number desired, is connected in parallel, that is, with their positive terminals joined together, and their negative terminals joined together. This acts as a single dry cell, still of  $1\frac{1}{2}$  volts, but of greater current capacity.



## Everyday Science

### Novel Lightning Researches By Amateur Photographers

A study of French lightning is being made by amateur photographers organized by the Astronomical Society of France. Already many photographs of lightning flashes have been sent in and studied by the Society's experts. It has been found that these flashes seldom if ever are single, but that there are always a number of back and forth surges of electricity between the earth and the clouds almost like an electric arc following the path of the first spark where this spark has broken down billions of atoms of the air gases and to make the path more highly conductive for electricity.

This is a conclusion already considered probably by American observers using high-speed motion picture cameras. Another and less well-known conclusion of the French study is that the path of a lightning flash may continue to glow for an appreciable time after the electric flashes have ceased entirely, this glow presumably being caused by the re-combinations of the atoms of air gases decomposed by electricity.

One of the chief needs of further lightning study, it is stated by Dr. Emile Touchet, vice president of the society, is for additional photographs of lightning flashes by cameras with plates moving at high speed, so that the direction of the flash and the nature of its motion through the air can be determined. Another need is for stereoscopic photographs of the same lightning flash from two or more different points at measured distances apart on the ground, so that the heights and distances of the two ends of the flash can be computed. Members of the society are now being asked to attempt these additional tests.

### Residents in Wine District Noted for Long Lives

The argument that the habit of drinking wine conduces to a long life, as well, perhaps, as a happy one, is revived in a recent announcement from the agricultural and meteorological section of the Astronomical Observatory at Lyons, France. Interested by newspaper reports last year that the district of Médoc, in France, long famous for the soundness and cheapness of its local wines, also was famous for people who had reached very advanced ages, the statisticians of the observatory have computed the average percentages of persons more than 60 years old in several typical regions of France.

The longevity of Médoc denizens is reported as confirmed.

Numerical percentages mean little because of the many factors that affect the problem and many uncertainties in the figures. It is believed to be unquestionable, however, that old people are definitely more plentiful in this famous wine country than in other regions not so noted for wines or for temperate wine drinking. There are possibilities, it is admitted, that other factors may be operating to bring about this same result; an especially healthy peasant stock, for example, unusually good food, favorable weather, perhaps others.

French physiologists maintain, however, that the moderate, regular drinking of good wine provides the body with mineral salts, vitamine materials and other similar benefits less likely to be obtained in other ways, so that the exceptional chance of long life enjoyed by the Médoc wine

### "Spins on Silent Wheels"

Depression or no depression, the ruthless technological revolution goes forward. Spins on silent wheels. Not 30 days ago, near Pittsburgh, a new process of making wrought iron, known as the Aston process, was dedicated to commercial uses. The process puts the production of wrought iron on a quantity basis. Under the old hand method, the mill could turn out 5,000 tons of wrought iron a month; with the Aston process, the output will leap to 50,000 tons a month. And—note—under the new method 100 men can produce as much wrought iron as 1,000 men did under the old. Already the management is looking for new jobs for the picturesque puddlers. Inasmuch as there were only 5,000 puddlers in the United States in 1920, it is likely that there will be none in 1940. The puddler (Secretary of Labor Davis' trade), along with the blacksmith and the glass blower, all ancient and honorable crafts, is disappearing under the flail of scientific production.

How rapidly machine technology develops. Three years ago when we first began to write about it, we were looked at askance as if we were talking about the fantastical. Now machine displacement of men is on everybody's tongue. The schoolboy has learned the phrase technological unemployment, and the man on the street knows his chief competitor. Not only machines, but the physiochemical process displaces men. The revolution proceeds. It moves silently into every department of life.

—Electrical Workers' Journal.

drinkers may be due in part to that habit as well as to weather, food or other circumstances.

### The Foot Candle Meter

The foot candle meter is a small, self-contained instrument which measures illumination intensities in foot candles. This unit is rapidly becoming recognized as the popular as well as the scientific measure of intensity in illumination, which makes the application very practical. Technical knowledge is not required in the use of the meter because the adjustment is very simple and determinations are readily made.

The foot candle meter meets a long-standing demand for a small portable instrument which can be used for measuring the light delivered in the work. This effective light is what the consumer actually pays for and is therefore the only kind of illumination in which he is interested from a commercial standpoint. Factory tests have proved that higher intensities than those now in general use result in improved labor conditions and increased production.

### Household Electricity Most Deadly in Bathroom

That low-voltage electric wires as used in households are not entirely safe to handle, especially in the bathroom, is the conclusion of a committee of the American Society of Safety Engineers which has been studying household electric fatalities, expressed in a recent report to the National Safety Council, of Chicago. Over 100 recent electric deaths were traced by the committee to ordinary alternating current wiring at 110 volts, 31 of these accidental electrocutions being in households.

The danger is especially great, the committee points out, when the person who touches the charged wire is wet or is standing on wet ground or on a wet floor. Several electrocutions, for example, have been of people working in wet cellars or underneath cellarless houses with portable electric lamps or other exposed wiring. Among household fatalities, the chief source of danger is the bathtub, with 12 deaths out of the total of 31. Undoubtedly this is because the person standing or sitting in a bathtub is apt to be wet so that the high electrical resistance characteristic of dry human skin is reduced.

Seven household electrocutions were in the cellar group or where the victims were in contact with moist earth. Portable electric appliances like heaters, curling irons or heating pads



were responsible for six deaths and amateur experimentation with electricity caused one fatality. One safety precaution which the report suggests is that portable electric appliances like heaters or curling irons never should be used in bathrooms where they may come in contact with wet skin.

### Radio Detector Aids in Finding Single Lost Coin

British archeologists engaged in digging up the remains of Roman civilization in England and of the still earlier civilizations of Babylonia and Egypt have devised a radio detector of metals, said to be so delicate that not only will it locate a single coin buried in the debris of some ancient city, but will tell whether the hidden coin is lying flat on its side or is standing on edge.

The device is proving invaluable, it is reported, in such work of excavation, since it often is possible to locate by its aid spots where digging will be rewarded by finds of metal articles, without employing the usual expensive method of cutting deep trenches back and forth across the site to be investigated. Even when such trenching is done, some important metal object may happen to be missed a few inches by a trench and never discovered.

The radio detector, on the other hand, is said to be capable of finding such objects infallibly. One shortcoming of the instrument, however, is that it will not locate pottery or objects made of stone, bone or wood, but only those of metal. The device consists of a set of coils in which radio oscillations of a special variety are kept in circulation by vacuum tubes like those of a radio receiver. When these coils are carried along close to the ground any metal object not too far underneath disturbs the oscillations in the coils. This disturbance can be detected by a suitable meter and serves as the indication of a nearby metal.

### Panic Danger Induces London to Ban Skyscrapers

London is determined to have no skyscrapers. Regulations recently approved by the British Government to go into effect on October first, reduce the limit of building heights, exclusive of domes, towers and other special roof structures, to a maximum of 80 feet. The previous limit of 90 feet has applied for the last 40 years, before which there was no limit at all. With reasonable allowance for the heights of ceilings the new regulation probably will restrict London offices and apartments to six or eight stories.

One reason for the skyscraper ban is fear of the stability of the London subsoil on which the building foundations must rest, these strata being softer and more compressible than the

rock which underlies most of New York City. Another reason is light, the London health authorities believing that close building of tall structures would decrease daylight and sunlight harmfully to the health of occupants; something probably already true of the skyscraper population of New York.

### Fear Sudden Panic

The chief reason for the London ban, however, is reported to be fear of the results of a possible sudden panic due to earthquake, explosion or some other event which would spill the human contents of many skyscrapers into streets too small to hold them. It is fortunate that no such event has happened in New York since the skyscraper era—the Black Tom explosion during the war years being at night when the skyscrapers were not occupied. If New York ever does have such a daytime panic London authorities believe that one of the world's greatest catastrophes may result.

### Slipshod Recording Methods Now Definitely Behind Industry

Noiseless recording is sounding the death knell of slipshod talking picture producing and processing, according to H. B. Santee, Electrical Research Products' Director of Commercial Engineering who has just returned from a survey of the Hollywood studios of producer-licensees using the Western Electric sound system.

Practically all of them have installed or are installing equipment for noiseless recording. They are unanimous in agreeing that this recording marks the greatest milestone in talking picture progress since sound itself was introduced. They agree that the new recording will necessitate a more rigid adherence to standards in production recording and in processing.

"The difference is that under the old recording methods a certain amount of deviation was permissible from these standards," Mr. Santee explained, "because any slight imperfections in the noises were masked by the ground noises themselves. Now with the ground noises eliminated by the noiseless recording, the other imperfections will be painfully obvious.

---

*Inasmuch as most good things are produced by labor, it follows that all such things ought to belong to those whose labor has produced them. But it has happened in all ages of the world that some have labored, and others, without labor, have enjoyed a large proportion of the fruits. This is wrong, and should not continue. To secure to each laborer the whole product of his labor as nearly as possible is a worthy object of any good government.*—Abraham Lincoln.

---

The only alternative is going to be an insistence upon a standard of recording and processing that does away with them.

### Recording Standard Unchanged

"We want to make it clear that the standard itself is unchanged. What was best under the old system of recording is still best and has been retained. What is being changed is the greater need for adherence to this standard to bring out the superior advantages of noiseless recording. It is in this general policy of exacting more rigid standards all around, as well as in the direct technical improvements that noiseless recording is proving itself of such benefit to the industry. The improvement applies not only to the studio and the film laboratory but also to the theatres where a more rigid inspection and maintenance of reproducing equipment will be essential."

### Man Has Hand for Grasping; Woman for Picking Up

The curious fact that the first finger of a woman's hand is almost always longer than her third or "ring" finger, while the first finger of a man's hand is likely to be shorter, has been confirmed by Mr. Ruggles George, of the University of Toronto, and is reported by the Wistar Institute Bibliographic Service of Philadelphia. The result was obtained, Mr. George reports, by examining 630 hands of white adults in North America. There is no difference between right hands and left hands in this particular; both feminine hands tending to have long first fingers while both masculine hands have long third ones.

Mr. George's announcement does not commit him to any theory of the cause of this curious difference, although some cause must exist in differing activities or heredities of the two sexes.

### Social Conditions Responsible

It is tempting to consider the difference a result of different habits of men and women in savage times or in the still more ancient period when mankind was evolving slowly out of ape-like creatures. Under such savage or pre-human conditions the male hand probably was used most importantly for grasping something; perhaps the limb of a tree or the handle of a weapon. Such use might be expected to strengthen and lengthen the third finger, which is at the center of the grasp. Under the same social conditions women, it is probable, had much less need to grasp things but greater need to handle small and delicate things, like picking seeds from the ground or out of a seed pod or handling small domestic tools like pins or needles. Thus the first finger, which is used chiefly for such things, got more exercise from its feminine owners and grew correspondingly longer.



# Review

## Colored Film Processes

THREE years ago the motion picture industry generally, and Hollywood particularly, was just entering seriously the field in sound photography. At the present moment color photography, or rather the anticipation of it, is in the minds of all motion picture producers. It is the desire of the author of this article to call to the attention of those interested in the general subject of color some of the underlying physical facts of color photography together with a historical résumé of what has been done in this field.

One must first go back appreciably and review somewhat some of the fundamental facts in the study of light. From the physicist's point of view, the study of light is a study of activity which originates in luminous bodies and causes the sensation of vision when it enters the eyes. There are two distinct phases in the study of light: first, *quantity*, which deals with differences in brightness and, second, *quality* differences are classified under the phenomena of color.

### Newton's Contribution

Sir Isaac Newton made many advances in the study of light and his many experiments led him to believe in a certain hypothesis. Newton was the first to get a clear idea of color, which idea he attained through a study of glass prisms. He was the chief advocate of the corpuscular theory which maintained that light consisted of very minute weightless material particles. It is rather a strain on the imagination to think of material corpuscles flying with enormous speed through a solid substance like glass with so little hindrance as glass seems to offer to the passage of light. It is also somewhat difficult to explain the phenomena of reflection and refraction under this theory. Color was accounted for by differences in size and shape or in some other characteristics among the corpuscles.

### Theories of Color Vision

The newer, and at present accepted, theory considers light as made up of waves acting in much the same way as waves produced by disturbances in a body of water. Under this theory there is little difficulty in explaining reflection and refraction. Furthermore, color is accounted for very simply by the supposition that differences in color correspond to differences in the length of the waves. The medium in which these waves act is termed "ether," which means that empty space has properties other than mere extension; properties that enable disturbances carrying energy to pass through, the passage requiring finite time. We know that light travels at

a rate of approximately 186,000 miles per second.

Prior to actual work on the recording of color photography, it is necessary to consider somewhat the theories of color vision. One, that of Young and Helmholtz, is a purely physical theory, while another, that of Hering, is psychological. These two theories are given considerable weight. The Young-Helmholtz theory considers that the retina consists of three distinct sets of nerve fibers, each giving a single sensation, one set a red sensation, another a green, and the third a blue-violet sensation.

The Hering theory deals with three primary sensations and postulates certain contracts caused by chemical changes under the influence of light in three hypothetical fluids.

Our present existing knowledge teaches us that there are three primary colors, and these three colors are blue, green and red. Newton at one time advanced the theory that there were seven primaries. However, based upon work by physicists and psychologists, it is pretty well established that blue, green, and red are considered universally as the three primaries.

### Color Photography

Three-color photography is based on the fact first discovered by Clerk Maxwell about 1860 that all colors can be matched by a mixture of the three primary colors, red, blue, and green, if the proportion of these constituent colors be rightly chosen. The work of Maxwell was based on the discovery by Young in 1807 that all color perception is the result of three fundamental color sensations singly or in various combinations and proportions, and it is safe to say that the work of Maxwell is the foundation upon which three-color process of natural color-photography is based.

Prior to Maxwell's time such men as Seebeck, Becquerel and Daguerre did quite a little experimental work on the reproduction of color, but they were handicapped by the fact that they could give only a partial reproduction and had no way to fix their images.

### Workers in the Art

Later on, natural color photography necessitated the use of a light sensitive dye which faded out to a colorless substance. A dye is decomposed only by the light which it absorbs, which color is complementary to its own color. Certain aniline dyes bleach comparatively rapidly in light, hence after three such dyes are chosen so as to form the three fundamental colors, red, green and blue-violet, and these are coated on a white surface

such as paper in three separate layers and the whole exposed to a colored object, in red light, the blue and green dyes are bleached out, leaving the red. In the same way in blue light, blue will be left as red and green are bleached out, and in the case of green, red and blue are bleached out, while the colors which are mixtures of these each will be bleached in direct proportion to the amount of the fundamental colors present.

Processes based on this principle were conceived by such men as Cros in 1861, Leisegang in 1889, Ives in 1891, and others up until 1910.

Despite the apparent simplicity of the process, it has never furnished a satisfactory solution to the problem of natural color photography. It was difficult to secure three dyes having the proper color and of identical light sensitiveness, and it was further difficult to prevent further bleaching of the dye after exposure.

In 1897, Prof. Lippman, of Paris, devised an ingenious process of color photography dependent upon the principle of light interference. Lippman's method was to expose a specially prepared fine-grained transparent emulsion of silver chloride in contact with a bath of mercury which reflected back into the emulsion the waves of light which reached it, thus setting up in the sensitive film the phenomena of interference. This process, however, although extremely interesting, was little more than a laboratory experiment from the standpoint of producing photography in natural color.

This brings us back to the time of Maxwell, who, as previously stated, did the basic work on the principle of three-color photography.

### The Additive Process

In natural color photography there are two very general classifications, the additive and subtractive processes. As a general statement the additive process of color photography can be summed up in the statement that we start with a colored light from which we produce white by addition. In other words, we take red, green and blue and by an additive method produce a white light. Photographically, this process may be analyzed as follows:

The color sensation negative records by density the presence of that particular color in the subject, i. e., the red sensation negative records the red of the subject in terms of greater or lesser density, according to the amount of red present in the various portions of the subject. A positive transparency from this negative will reproduce the red sensation by means of its clearer parts. The parts of the subject containing the purest red will be represented by clear glass, those parts with some red by a medium density, while those parts containing no red whatever will be of maximum density. Now if this transparency is viewed in red light it will reproduce the red sensation of the original sub-



## *Producers prefer these new, more beautiful tinted films*

**I**N THE newsreel, the animated cartoon, or other short... wherever the original lighting or the dominant mood is to be expressed... Sonochrome Films play an ever more important role. They, alone of all tinted films, transmit sound with complete fidelity. They offer a wide choice of over-all colors more charming than those used in the silent-screen era. And they cost no more than ordinary black-and-white positive. Producers who want greater beauty in their tinted pictures... at no extra cost... specify Eastman Sonochrome. Eastman Kodak Company, Rochester, New York (J. E. Brulatour, Inc., Distributors, New York, Chicago, Hollywood).

**EASTMAN SONOCHROME  
TINTED POSITIVE FILMS**

## **For Perfect Projection**

use

## **S.O.G. IGNAL Condensers**

Highly polished — Will not Discolor  
Throw an Even White Light on the Screen

Full Particulars

## **FISH-SCHURMAN CORPORATION**

45 West 45th St.  
New York City

6364 Santa Monica Blvd.  
Hollywood, Calif.

ject. In a like manner the blue and green transparency will, when viewed in blue and green light, reproduce the respective color sensations of the original subject.

The three records may now be combined and the natural colors of the subject reconstructed by presenting each transparency with its proper filter in a viewing instrument. This may be done by projection with the use of a triple lantern, in which case the red, green and blue transparencies will be projected simultaneously from the lantern forming one picture in natural color on the screen. This process of color photography reached its highest development in the hands of Mr. F. E. Ives, whose Kromscope has never been surpassed for absolute fidelity in color photography.

The triple lantern is wasteful of light, and there are other defects in the additive process which make it somewhat unsatisfactory commercially. The subtractive process is a more commercial method and is much more widely used. In subtractive processes the three negatives through the red, green, and blue filters are taken as in the additive process but they are printed to be used as superimposed prints, each print being made in a color which is complementary to the taking filter.

### **The Subtractive Process**

Let us consider our discussion of the subtractive process as confined to still photography in the making of prints. When we print from the red sensation negative we are printing from the thinner parts of those parts which represent the absence of red in the subject, hence the red sensation negative must be printed not in red but in a color which completely absorbs all red. In other words, the red negative is printed in its complementary color—that is, blue-green. The green negative, therefore, will be printed as magenta, and the blue negative as yellow.

Superimposed in full strength these colors absorb all color, and the result is either black or gray, according to the amount of light reflected. Intermediate colors are produced by the mixture in various proportions of the three fundamental colors; while the total absence of color will produce white, provided we are printing, for example, on white paper or if we are printing a transparency to be viewed by white light. It will be observed that in this case we start with white light from which we produce color by subtracting various colors, hence the name "subtractive process."

### **Subtractive Process Favored**

These two processes may be differentiated one from the other very simply as follows: The additive process is one in which we start with colored light from which we produce white; while the subtractive process is one in which we start with white light and from which we produce col-



ors by subtracting the various colors.

The present-day commercial processes are most generally based upon the subtractive principle and it is quite probable that those processes which will be most successful commercially, from the motion picture viewpoint, will be those making use of this principle.

### Annual Council Meeting in New York on Feb. 11th

The second annual meeting of the Projection Advisory Council will be held in the Hotel Astor, New York City, on February 11th at noon. At this time the election of officers for the coming year will take place, and reports of the various committee chairmen will be read. Plans for the coming year will be discussed and formulated. Present indications are that the entire present list of officers, with possibly very few exceptions, will be re-elected. Some changes will be made in committee chairmanships, to provide for certain vacancies which exist as a result of the inability of the present incumbents to serve.

#### Annual Luncheon Feb. 11th

Immediately following the business session, a luncheon will be given in the Astor Gold Room. President William F. Canavan of the International Alliance will be the guest of honor at the luncheon. Other prominent guests will be present including S. L. Rothafel (Roxy); Sam Katz, President, Publix Theatres; Sidney Kent, vice-president and general manager, Paramount-Publix Corp.; Fred Dempsey, General Secretary-Treasurer, International Alliance; and Sam Kaplan, President, L. U. 306.

Tickets for the luncheon may be had from Charles Eichhorn, M.P.M.O.U. Local 306, 125 West 45th St., New York City; from James J. Finn, 45 West 45th St., New York City, or from the Council direct at P. O. Box 90, General Post Office, New York City. Executive vice-president P. A. McGuire is in charge of arrangements for the luncheon and will preside.

### Film Fire Statistics

Seventy-one per cent of all theatre fires originate in the projection room while machines are in operation, causing hundreds of fires, annually and resulting in a yearly loss of approximately \$3,000,000 to theatre properties and equipment. Losses sustained from destroyed film in theatre fires, which are not included in the \$3,000,000 total, would send this figure considerably higher.

Theatres suffered an \$18,000,000 loss during the five years from 1922 to 1926, inclusive, with the average for recent periods being lower, due, principally, to the many new devices and types of equipment now being built to eliminate fire hazards.



## HIGH INTENSITY SPOTLIGHT

**MORE AND BETTER  
STAGE LIGHTING AT  
LESS EXPENDITURE OF  
ELECTRICAL ENERGY.**

**MOST REMARKABLE  
RESULTS ON LARGE  
STAGE SETS.**

**HALL & CONNOLLY, INC.**

24 Vandam St.

New York, N. Y.



## Your Preference, Please!

THE editors of THE MOTION PICTURE PROJECTIONIST solicit your aid to the end that this publication may be of the maximum service to you. Every subscriber can do his bit to improve this service by using the space provided below to indicate his preference for special articles and other material in which he may be particularly interested.

Let us know your preference, please. All requests will receive attention in the order of their receipt, so act quickly. Use the blank below to tell us in just what subject you are particularly interested. Do it now!

Editor,  
M. P. PROJECTIONIST:

I am interested in the following subjects, on which I should like to see information in THE MOTION PICTURE PROJECTIONIST:

1. ....
2. ....
3. ....
4. ....

NAME .....

ADDRESS .....



## Good Projection Requires Good Rectification



M. P. 25-25

## Good Rectification Means FOREST RECTIFIERS

**T**HIS Forest Rectifier meets the demand for a single unit to supply direct current for two projectors, and will furnish 15 to 25 amperes to either projector continuously.

It supplies a steady direct current, free from pulsations, and will produce a better light than other current supply devices. The only wearing parts are the bulbs which will last at least one thousand hours and usually much longer since only two bulbs are being used at a time (except during change over) and the load is alternately carried first by one set of two tubes then the other two as the projectors are alternately used.

This Forest Rectifier embodies the use of four rectifier tubes which are connected to supply current to two direct current circuits independent of each other thus preventing loss of current at the first arc when the second arc is struck.

Both arcs can be operated at the same time during the change over period and there will be no diminishing of the light from one projector while lighting up the second.

Two Ammeters are mounted on the unit which will show at a glance the amperage being used at either arc.

Links are provided for operating from 110-220 or 240 volts.

Rectifiers for all purposes made in 15 amp., 25-25 amps., 30, and 65 amps. sizes.

*We are specialists in our field. Send us your technical problems. Literature on request.*

### FOREST ELECTRIC CORP.

New and Wilsey Sts.

Newark,

N. J.

## The "Dubbing" of Sound Pictures

(Continued from page 33)

positions, in order to combine several sound tracks. At the same time microphones and non-synchronous records can also be mixed in. In some elaborate cases of combined dubbing and synchronizing, as many as seven or eight mixer positions may be in use simultaneously. These might include the original dialog, a sound track of street noises, a synchronized track of background music, a non-synchronous record of characteristic crowd noise, one or two microphones for direct pickup of special sound effects, and so forth. All of these are under control of the monitor man and can be faded in or out in any desired combination. The combined output is recorded in the usual fashion on film to produce a new negative which is finally cut into the finished picture.

Obviously, the quality of the combined product depends to a great de-

gree upon the fidelity with which each separate sound track is reproduced during the dubbing process. There is a certain amount of distortion inherent in any form of reproducing apparatus. In a high-grade projector using a carefully prepared release print this distortion is quite small, and for this reason the sound reproduction in high-class theaters is as a rule quite satisfactory. When reproducing sound track for dubbing purposes, however, it should be remembered that whatever distortion is present, even though it be very slight, it is recorded into the new sound track, and when this track is again reproduced in the theatre, the two distortions add up, and the final effect is much more noticeable.

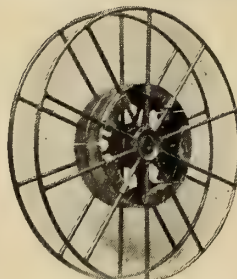
### Data on Distortion

It might be well at this point to go into some detail regarding the inherent distortion present in a sound projection machine so as to make clear why it is negligible in a theater using high-quality release prints, and why it constitutes a serious problem in dubbing work, where we must obtain exceptionally good reproduction and must get it from green film. (Green film is the name given to film which is fresh from the laboratory and has not been run through a projector more than once or twice.) The distortion present in a sound projector may be divided into two types. One



### Theatre Equipment NEW AND USED

Most complete stock in the U. S. Moving Picture Machines, Screens, Booths, Opera Chairs, Spotlights, Stereopticons, Film Cabinets, Portable Projectors, M. P. Cameras, Generator Sets, Reflecting Arc Lamps, Carbons, Tickets, Mazda Lamps and Supplies.  
Projection Machines repaired and overhauled. Repair parts for all makes opera chairs. Attractive 3 x 10 ft. muslin banners, \$1.50; on paper, 50 cents.  
We Pay Highest Prices for Used Projection Machines, Opera Chairs, etc.  
Everything for the Theatre—Write for Catalog K.  
Movie Supply Co., 844 Wabash Ave., Chicago



Type "C" Sound Reel

## Spot Welded!

—which means that *only in this reel* do you get that lasting durability and excellent performance necessary for that perfect show. And at attractive prices.

Send for Literature

UNIVERSAL ELECTRIC WELDING CO. « 37th Avenue and 10th Street  
Long Island City, N. Y.

## "BEST" Magazine Light



Price \$3.50 at your dealers

attaches to side of magazine illuminating the inside showing the exact amount of film on reel from either side without opening door.

**BEST DEVICES CO.**  
200 FILM BLDG., CLEVELAND, O.



is the loss of high frequencies, and the second is the introduction of a mechanical flutter due to lack of absolutely uniform motion of the film past the scanning beam in the sound gate, which results in distortion of the high frequencies. The simple loss of these high frequencies is not a very serious matter in a good projector. By actual measurement of frequency test films, recorded at constant level with our best commercial recording set-up, there is no appreciable loss up to 2,000 cycles, and from this point upward, the loss increases gradually to about 9 db. at 6,000 cycles. This loss includes both the recording and reproducing loss, and is not serious because it can be compensated for by the use of a suitable equalizer.

The introduction of mechanical flutter, however, is a much more serious problem. This flutter is apparently caused chiefly by the friction which is present between the film itself and the pressure pad which holds it in the focal plane of the optical system of the sound head. If the film has become thoroughly dry and the emulsion hardened by several days' aging, and if it has acquired a slight coating of oil as a result of having been played through a projector five or six times, the friction between film and pressure pad is very slight and uniform, and the flutter is quite negligible. If, on the other hand, the film is green, the friction is much greater and less uniform, with the result that considerable flutter is produced which results in reproduction which is popularly described as being fuzzy or

raspy. In addition to this, the softness of the emulsion allows some of it to scrape off and pile up on the pressure pad to such an extent that the film sometimes goes considerably out of focus, with resulting loss of volume especially at high frequencies.

Much work has been done on the development of special equipment which would be capable of high quality reproduction regardless of the mechanical condition of the film. An ordinary film recording machine has recently been modified to enable it to be used as a reproducer, and appears to solve the problem quite well. This machine is capable of reproducing up to 9,000 cycles without appreciable flutter, and the frequency characteristic is better than that of an ordinary projector to the extent of about 6 db.

## THE BIOSCOPE

The Leading Journal of the British  
Cinematograph Industry

20th Year of Weekly Publication

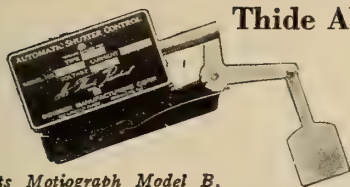
Contains a complete section each week  
for the special benefit of Projectionists.

Cash prizes awarded for original ideas  
published. Specimen copies 18 cents.

Annual Subscription 7 dollars 50

THE BIOSCOPE PUBLISHING CO., Ltd.  
8-10 Charing Cross Road, London, W. C. Eng.

## DEPENDABLE PROJECTION--CONTINUOUS SHOWS--



Fits Motiograph Model B,  
Simplex and Super-Simplex,  
and Sure-Fit. With or with-  
out Rear Shutter Mounts.

### Thide AUTOMATIC SHUTTER CONTROL with 3-wire circuit foot switch

Rear Shutter Mounts  
require Model D type.  
Your Model A Change-  
over replaced with  
Model D type. Liberal  
allowance for Model A.

#### The Standard Changeover

Simple for mounting and replace-  
ments; every part machine tooled  
and precision assembled. Special  
wound coils for D.C. any voltage  
and for A.C. any voltages and fre-  
quency. 3-wire circuit foot switch  
allows synchronization of all pro-  
jectors with effect machine.

# DOWSER

691 LINCOLN PL. MANUFACTURING CORP. BROOKLYN N.Y.

IN WESTERN CANADA!

## CANADIAN THEATRE SUPPLY CO.

Authorized distributors for  
SIMPLEX—MOTIOGRAPH—POWERS—HOLMES

and all theatre equipment of the leading manufacturers. Also, an extensive line of  
stage equipment.

Complete Sound Picture Service!

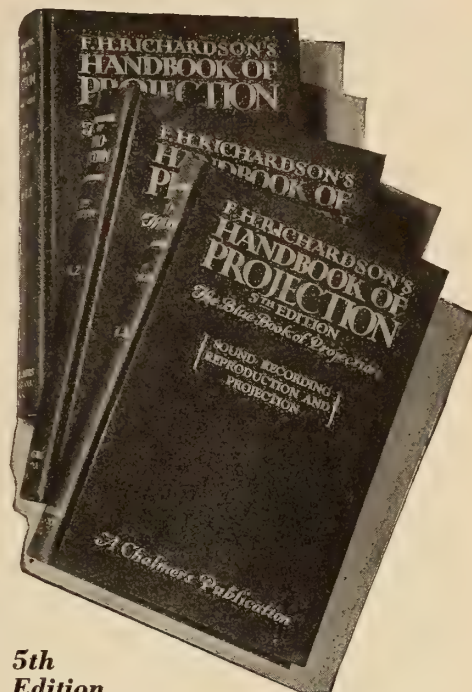
306 Canada Building  
Winnipeg, Man., Canada

Alberta Representative

M. L. ADAMSON

9921—113th St., Edmonton, Alb., Canada

## THE BEST SELLER



5th  
Edition

## HANDBOOK OF PROJECTION

By F. H. Richardson

Back in 1910 Mr. Richardson wrote the first Handbook of Projection. It was a sell out. Second, third and fourth editions, each bigger and more successful have followed. The present fifth edition in three separate volumes, illustrated above, is the culmination of years of intensive effort.

Richardson is no swivel chair author. He knows the problems of the field—meets the men on their own ground. His books reflect a practical knowledge of just what information is needed. Recently he completed a 17,000 mile trip through the U. S. and Canada in the interests of projection.

### CONTENTS

Volumes I and II are devoted entirely to the general subject of projection and everything related to it. Volume III deals exclusively with sound projection. All three volumes are profusely illustrated and contain over 1,400 pages of projection information written so you can understand it clearly. Each volume contains Richardson's famous question and answer index giving immediate access to hundreds of different problems.

These are the books which are being used by projectionists and theatre managers all over the world to secure improved results. Send for this finest of projection libraries today.

### USE COUPON TO ORDER

CHALMERS PUB. CO. (M)  
516 Fifth Avenue, New York, N. Y.

Enclosed find (check) (money order) for  
\$10.25. Send Richardson's 3 volume Hand-  
book of Projection to .....

### WINNIPEG, CANADA

J. M. RICE & CO., J. M. Rice, Prop. Leading equipment dealers in all kinds of projection room equipment facilities. Representatives of leading equipment manufacturers of the United States and Canada. All our merchandise guaranteed for performance and stability. Whatever you want, we will supply it.



# Hoffmann-Soons

Every known quality necessary in producing perfect projection is embodied in perfection rheostats.

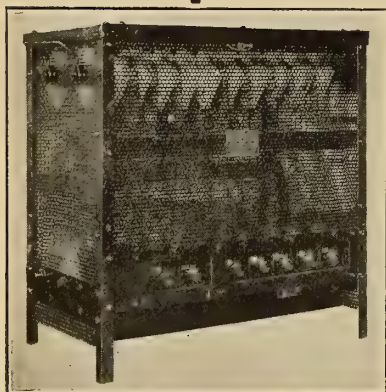
## PERFECTION

THE ONLY UNION MADE RHEOSTAT  
Recognized as the highest standard everywhere

Now equipped with solderless adjustable lugs to take wire size from No. 4 to 4/0 without any additional cost.

We Build Rheostats for Special Requirements. Communicate With Us Direct. There Is No Obligation.

[ Sold by all branches of the National Theatre Supply Co., Sam Kaplan, New York, Continental Theatre Accessories, and by your dealer. ]

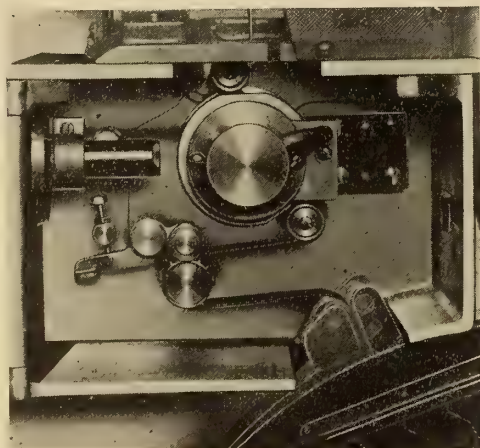


**HOFFMANN-SOONS**  
ELECTRICAL AND ENGINEERING CORPORATION  
387 First Avenue      Mfg. Division      New York  
Contracting Electrical Engineers—Moving Picture  
Theatre Electrical Specialists

# RHEOSTATS

## "SYNCROFILM"

delivers perfect sound reproduction, as hundreds of satisfied users will testify . . . HERE ARE THE REASONS:



Syncrofilm has been engineered for ease of installation and trouble proof long life operation. No expense has been spared to perfect this sound head.

Syncrofilm is supplied for attachment to all popular models of projectors.

Complete wiring and installation instructions are furnished as part of every installation.

Price and Particulars on request

**WEBER MACHINE CORP.**

59 RUTTER ST.,

ROCHESTER, N. Y.

Export Dept., 15 Laight St., N. Y. C. Cable, "Arlab," New York

at 6,000 cycles, without equalization of any sort.

Another development which has been worked out for the purpose of accelerating the dubbing and synchronizing of pictures is a "toe recording" process which enables one to dub directly from the negative of a sound track, without waiting for a print to be made. Toe recording is the process whereby the exposure in recording is held down to a point where we operate on the toe of the negative H. & D. curve of the film, rather than the straight line portion. This process has been evolved with the view of making the negative and print interchangeable, so that prints can be made if desired, but the negative itself can be used to save time. As a matter of fact, it has been found that the negative gives even better quality than a regular process print. Use of this process is made where the synchronizing music is first recorded on separate tracks and these tracks later dubbed with the original dialog.

### Dubbing Equalizers

In recording sound tracks which are to be used for dubbing purposes, the level is kept as high as possible, so that the ground noises will be relatively low. This is important especially when equalizers are used, as the action of an equalizer usually results in bringing up the ground noise. Two forms of simple equalizers are used. In dubbing from film to wax it is, of course, necessary to reduce the energy of the low frequencies; this is done by shunting an inductance coil of proper value across the projector output. In this way there is obtained a gradual cut-off of low frequencies from 500 cycles down. In

## GOLDE

### Better Projection Aids

#### Manumatic Changeover

Noiseless changeover for sound pictures at a moderate cost.

#### 30% Carbon Saver

Saves 30% on every 9 mm carbon used. No drilling; no inconvenience.

#### Long-Life Carbon Jaw

For Hi-Lo lamps; guaranteed for 6 months, will last years.

#### Automatic Motor Rewind

Best enclosed rewind ever developed—works by gravity—always dependable.

#### Uni-Lens Mount

Only successful method for use with wide screen projection.

#### Framing Light Shield

Allows no light spill in any position—protects the eyes—makes framing easy.

Order from your Supply Dealer or from

**GOLDE MANUFACTURING CO.**  
2015 LeMoyné St., Chicago



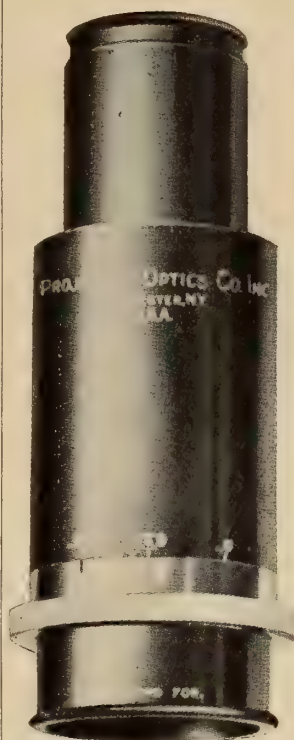
dubbing from film to film use is made of a tuned circuit filter giving a gradual rise at high frequencies beginning at about 2,000 cycles and coming to a peak at 6,000 cycles. This rise in high frequencies approximately compensates for the combined loss which takes place in recording and reproduction.

#### Indirect Recording

As is quite well known, it is important to have the microphone reasonably close to the source of sound in order to obtain a good recording. Instances often arise where extremely long shots are necessary and make it impossible to get the microphone closer to the principals than thirty or forty feet. A good example of a case of this sort is in the shooting of large chorus scenes with one or two principals singing out in front. In viewing such a picture the audience would naturally expect the voices of the soloists to be clear and distinct, and to stand out from the voices of the chorus, and yet it would obviously be impossible to get a microphone close to the soloists and at the same time keep it out of the camera angle, especially if the principals move back and forth during the rendition of the number.

In instances such as these we resort to what is known as "indirect recording" or more popularity, the "synchronous playback." In this method the sound is recorded first, without the picture, so that the singers may be placed in any way desired. After a good take is obtained, it is printed and then played back on the stage through large horns. The cast then take up their regular formation on the stage and go through their actions in synchronism with the sound coming from the horns, while the cameras grind. The picture is then printed together with the original sound track, and the final effect gives the illusion that both sound and action took place at the same time. In this way it is seen that full scope is given to both the sound men and cameramen to do the most justice to their respective tasks without handicapping each other. It should be understood, however, that this is not a faking process in the ordinary sense of the word, because the voices we hear are actually those of the people we see, except that they were not recorded at the same time that the action was photographed. It cannot be called a dubbing process either, since the original sound track is used. It is mentioned in this paper simply for the sake of completeness in order to cover all forms of recording other than simple, direct recording.

In closing this paper I would like to emphasize the fact that ordinary dubbing is not a form of faking, since, regardless of how many times a voice may be re-recorded for the purpose of adding sound effects, it still remains the actual voice of the person who is seen speaking in the picture. The only time voices are really faked



## SUPER-LITE LENSES

WISELY CHOSEN BY  
AMERICA'S BEST THEATRES

#### New Bifocal Super-Lite Lens

An adjustable focus lens with a wide range of foci for both silent and sound film.

#### Series III. Super-Lite Lens

Standard full Half-Size lens furnished in short focus as low as 4" E. F. and up to 10" E. F.

#### Series IV. Super-Lite Lens

Full 3" diameter lens to meet the demand for more light for longer throws. 6" E. F. to 10" E. F.

Quality Guaranteed

PROJECTION OPTICS CO., INC.

330 Lyell Avenue

ROCHESTER, N. Y.

U. S. A.

## KEEP all your COPIES of

MOTION PICTURE PROJECTIONIST  
AS A REFERENCE FOR CURRENT  
AND FUTURE NEEDS — PRE-  
SERVE THEM IN A  
BINDER

\$3<sup>00</sup>  
each

GOOD SOLID  
IMITATION LEATHER  
—GET ONE

ORDER FROM THE MOTION PIC-  
TURE PROJECTIONIST

Give This to Your Friend—Have Him Fill It in and Mail to us at Once

The Motion Picture Projectionist  
45 West 45th Street, New York City

Gentlemen:

Enclosed please find \$2.00 for which enter my subscription for one year (12 issues) starting with .....issue. (Two years, \$3.00.)

Name .....

Street .....City .....

State .....Local No. ....



# New

## The SUPER CINEPHOR

Lens and Condenser System



Projection Room of Roxy Theatre equipped with Super Cinephors

**DESIGNED** especially to meet the requirements of wide and "Grandeur" pictures! Also improves standard films.

This is the first projection lens to be fully corrected for astigmatism—hence the improved flat field and critical definition.

The condenser confines the light to an evenly illuminated oval of the same proportion as the wide film aperture dimensions, giving 50% more illumination.

Prepare for wide films by installing Super Cinephors now!

An illustrated booklet gives complete information. Send for it.

BAUSCH & LOMB OPTICAL CO.  
680 St. Paul St. « Rochester, N. Y.



# BAUSCH & LOMB

Makers of Orthogon Eyeglass Lenses for Better Vision

is in the preparation of foreign versions in which case it is done only to bring to foreign countries at least the face and personality, if not the actual voice, of a popular star. The old practice of using "voice doubles" to fake the speech of actors whose own voices were not suited for recording has been completely abandoned, and only those players who can record as well as act have survived the complete transformation which the microphone has wrought in the motion picture industry.

## High Speed Camera Analysis of Energy Expenditure

The average college sprinter in the 100-yard dash utilizes oxygen at a rate which is equivalent to the production of 13 H.P., according to the results of physiologists who have been studying the problem. With the aid of the high speed motion picture camera, an analysis has recently been made of the actual mechanical work done by these runners, who were icked at random from the gymnasium classes of the university.

From this investigation it was found that only about 3 H.P. are returned as mechanical work which could be accounted for by the movements of the various parts of the body. This makes the human machine only 23 per cent efficient.

By measuring the displacements of the body structures as they appeared when projected on a screen from over 2,000 separate film pictures, it has been possible to compute the velocities of the arms and legs during their wings. The results showed that more than half of the mechanical work was required to swing them and that 0.7 H.P. was expended to stop them at the end of the swing, making a total of 2.4 H.P. utilized in the arms and legs. The overcoming of the resistance of the feet making contact with ground required 0.4 H.P., while wind pressure and gravity accounted for 0.2 H.P.

## Noisy Reproduction Is Most Common Talkie Complaint

On a few occasions, crackling noises in an amplifier have come from a defective resistor. Western Electric amplifiers have many resistors for a certain definite fixed resistance. A defective resistor can be located with a head set, with a "C" battery connected in series.

Noisy reproduction is the most common of all complaints with sound reproducing equipments. During long experience with sound reproducing systems 70 per cent. of all troubles fall fundamentally into the noise category. It has been found that the noise problems are the most baffling of all to projectionists and servicemen.

Noises in amplifiers usually occur

## By Test Proven Best!



\$9.00  
Each

Imagine! Now on their second year of giving satisfactory service to Hi-Lo lamp users everywhere from Coast to Coast. Surely there must be a reason for this preference for the

### GEM CONTACT JAW

Designed right, made right, and priced right.

*Order a Spare Now!*

FOGELBERG ENGINEERING CO.  
128 S. Clinton St. Chicago, Ill.  
*Sold by Reliable Independent Dealers Everywhere*



during the performance and they are hard to find. Noise can emanate from so many different sources. Sporadic hissing, crackling and frying noises are usually caused by short circuits developing in vacuum tubes. Crackling and rasping noises are also caused by loose or high resistance connections.

#### Corroded Tips and Prongs

When the tube tips and the socket prongs have a film of corrosion over them, the grid and plate circuits are especially apt to be affected, which causes a spluttering or crackling noise. Most of the conductors used in amplifier circuits are so large that they will seldom if ever be burned out by any amount of current that can reach them. Burnouts are generally found in the tube filaments and in the windings of transformers and chokes and broken connections.

#### A. C. Hum

It has been found on a few occasions that a steady humming sound, during the presentation of Movietone subjects, was caused by a ground in one of the A. C. lighting circuits in the main auditorium. This caused an A. C. hum, which was very perceptible when the fader was set a few points above the normal setting.

Many Western Electric sound installations include motor generator sets instead of batteries. Crashing and crackling noises at certain times are caused by dirty commutators and sparking at the brushes. Oftentimes sparking at the commutators indicates a short circuit, or an open circuit, in the armature, a leak or ground on the line may also have the effect of overloading the armature of the generator. Commutators and brushes should be inspected at regular intervals. A slow-leaking condenser will cause fuzzy reproduction. The incorrect value of grid leaks and coupling condensers will also cause fuzzy reproduction. Harsh-toned reproduction is caused by increasing the values of grid leaks and coupling condensers. Increasing the filament current, also increasing the plate and grid potentials, will cause harsh-toned reproduction.

Crashing and crackling noises during Movietone subjects can usually be traced to dry "B" batteries when they are old and worn out. These dry "B" batteries supply potential for the photo-electric cell and plate potential for the pick-up amplifier.

A. C. hum is many times picked up on this circuit, when this circuit is adjacent to a heavily loaded light or power line, which creates induction.

It has been found, where complaints were received about metallic reproduction that in most instances defective receivers have been the cause of this trouble. Oftentimes, the threaded coupling, which holds the receiver in position, works loose and with the

15,000 Griswold Film Splicers are in constant use daily in theatres throughout the World. The standard film splicer for efficiency, durability and economy.

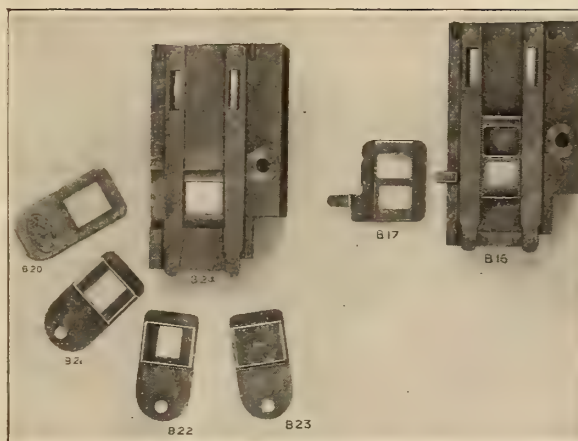
**GRISWOLD MACHINE WORKS**  
Port Jefferson, L. I. New York

## BLUE SEAL HEAT RESISTING IMPROVED FILM TRAPS

FOR SIMPLEX PROJECTORS

MADE OF AN IRON ALLOY

Guaranteed not to Warp under the intense heat of the Arc Spot. A necessity for the Perfect Projection of "Sound" Pictures



Manufactured by

**BLUE SEAL PRODUCTS CO., Inc.**

262 Wyckoff St.

Brooklyn, N. Y.

Manufacturers of Motion Picture Accessories Since 1913

- B-16 — Film Traps with Sliding Double Round Corner Apertures, one Aperture for Disc and Silent Film and one cut Proportional for Movietone Film to be used with our Adaptors. \$30
- B-17 — Sliding Double Aperture Plate. \$6
- B-24 — Film Trap with individual mats for silent, movietone and magnascope effect. Traps complete with all mats. \$30
- B-20 — Master Plate to hold mats stationary. \$1.50
- B-21 — Standard Aperture with Square Corners. \$1.50
- B-22 — Proportional Movietone Aperture with Square Corners. \$1.50
- B-23 — Blank Mat (CAN BE CUT ANY SIZE APERTURE) ... \$1.50

higher frequencies, this coupling rattles, which is very perceptible.

#### Microphonic Tubes

Nearly every projectionist or engineer has experienced the time when by touching or tapping the projector, it would produce a ringing noise, presenting Movietone subjects. This is called a "microphonic noise." The

Movietone amplifier is mounted and swings on a spring suspension for the main purpose of eliminating vibration. If this amplifier does not swing freely, machine noise will be carried through the reproducing system. If there is a microphonic tube in the first stage of the pickup amplifier it will be worse than ever. Inspect the wiring inside of this amplifier as the



wiring may be touching the amplifier some place, which will prevent the amplifier from swinging freely.

Crashing and crackling noises can sometimes be traced to a defective power transformer.

### Correct Splicing a Great Aid in Reducing Mutilation

The liability of film to damage makes it essential that splices be made carefully, securely and uniformly. This will aid in keeping prints serviceable and free from defects and in preventing projection troubles in theaters. Poor splicing causes loss of film and may increase the fire hazard during projection. Poor splices include those that are buckled, stiff and out of alignment and those which overlap too much or too little. Any sort of damage to film must be repaired as soon as it is observed.

Film splicers should *always* be used, for making film splices. Film may become stiff or may buckle through excessive scraping or too liberal application of cement, or both. To make a perfect splice, the emulsion must be thoroughly scraped on the sprocket hole edges as well as the remaining surface, otherwise splice will pull apart. Reels must be spliced from tail to head so that when the film is placed in the projection machine it will not catch. Scraping is done to remove the emulsion and properly to prepare the film to receive the cement, therefore it is necessary to scrape evenly and smoothly.

#### Sound Film Splices

Splices on sound track film must be painted in a triangular shape, on the *celluloid* side of the sound track, using black lacquer and an artist's small paint brush. Two sprocket holes on each side of the splice are considered the base of the triangle, the apex being the center of the splice.

Extreme care must be taken to insure that the outside of the triangle on both sides is smooth and gradually brought to the center.

The lacquer painting eliminates the "boom" sound which is caused by an extra layer of film being spliced over the original sound track, giving it extra density. If smoothly done, the painting will prevent distortion and the sound will gradually fade in and out.

Extreme care must be exercised to insure that all splices are made "in frame." A splice made out of frame is one having more or less than four sprocket holes to the frame or more or less than 16 frames to the foot.

### Requisites For Fire Protection

The best procedure in matters of fire protection is to have a careful study made of each theatre property by a trained fire protection engineer.

He should submit a written report outlining the various risks according to their location and recommending the correct type and size of equipment for the hazards involved. These recommendations should be supported by facts explaining why a particular type of equipment is suggested for each location.

#### Four Protection Essentials

When this is done by a competent person and the recommendations are followed out, the theatre management may be assured of having the *right equipment, properly charged, correctly located* and, following instruction of employes, *competently operated* when the need arises. These are the four essentials of fire protection. By observing them, management and employes alike will be prepared to prevent large losses of human life and property damage.

#### London S. M. P. E. Out

The London branch of the Society of Motion Picture Engineers has withdrawn from the parent body and will form a society of their own. The latter will be entirely independent of the United States organization in every way. There has been considerable dissension of late.

### Theatre Wins Court Decision on Supplanting Equipment

Judge Gavigan of the New York Supreme Court has granted a motion brought by the Rhinelander Amusement Company to dismiss a complaint brought against it by General Talking Pictures. The action arose when the Monroe Theatre in New York City, operated by the Rhinelander Amusement Company, sought to remove its De Forest equipment to replace it with a Western Electric Sound System. General Talking Pictures sought a restraining order which was denied by Judge McGoldrick of the Supreme Court, New York City. This denial was followed by a request to dismiss the complaint of General Talking Pictures which was granted by Judge Gavigan. In his decision he said in part:

#### Judge Denies Application

"Plaintiff seeks on the basis of a covenant which was never made to prevent loss of business which it might incur if theatre owners find other equipment better for their purposes, even if, in the course of a few years, plaintiff's devices should become so antiquated that to fail to replace them with newer ones would mean vacant houses and bankruptcy. Such a stipulation will not be implied from language in no way suggesting it. Furthermore, courts of equity do not enforce doubtful rights by injunction. Here, though, there is not even a doubtful right. Plainly, the right asserted is non-existent."

### Index of Advertisers

Bausch & Lomb Opt. Co.....	48
Best Devices Co.....	44
Bioscope, The .....	45
Blue Seal Products Co.....	49
Brenkert Lt. Projec. Co.....	6
Canadian Theatre Supply Co.....	45
Chalmers Publishing Co.....	45
Dowser Mfg. Co.....	45
Eastman Kodak Co.....	42
Enterprise Optical Mfg. Co.....	Cover
Fish-Schurman Corp. ....	42
Fogelberg Engineering Co.....	48
Forest Electrical Corp.....	44
General Machine Co.....	5
GoldE Mfg. Co.....	46
Griswold Machine Works.....	49
Hall & Connolly, Inc.....	43
Hertner Electric Co.....	12
Hoffman & Soons, Inc.....	46
Ilex Optical Co.....	Cover
Instruments, Ltd. ....	6
International Projector Corp.....	8
Kaplan, Sam, Mfg. & Supp. Co....	2
Movie Supply Co.....	44
National Carbon Co. ....	4
National Theatre Supply Co.....	51
Projection Optics Co.....	47
Rice, J. M., & Co.....	45
Roth Bros. & Co.....	7
Strong Electric Corp.....	5
Theatre Engineering Service.....	3
Universal Elec. Welding Co.....	44
Weber Machine Corp.....	46
Western Electric Co.....	11



GOOD FILMS COME FROM PRODUCERS' LOTS  
*but* **GOOD PICTURES**  
*are made in the projection room!*

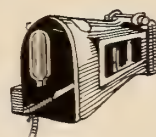
*The Sign of*



*Good Service*



Let's say a producer has bet a cool million on the success of his latest release. The film is a riot of matinee idols, wise cracks and sex appeal. It's full of vivid, dramatic appeal. Everything that a



big box-office smash needs is



there. But no matter how good

it is, what the public thinks about

it will depend a lot on the



work of some projectionist. Good films come from producers

lots but Good Pictures are made in the theatre! No projectionist



can do his job right without the best of reliable, up-to-the-minute equipment.

...."National Equipment" is an-



other name for it. First in new

design and improvement; finest in

quality, reasonable in price and



backed by a guarantee of maintenance service that no projec-

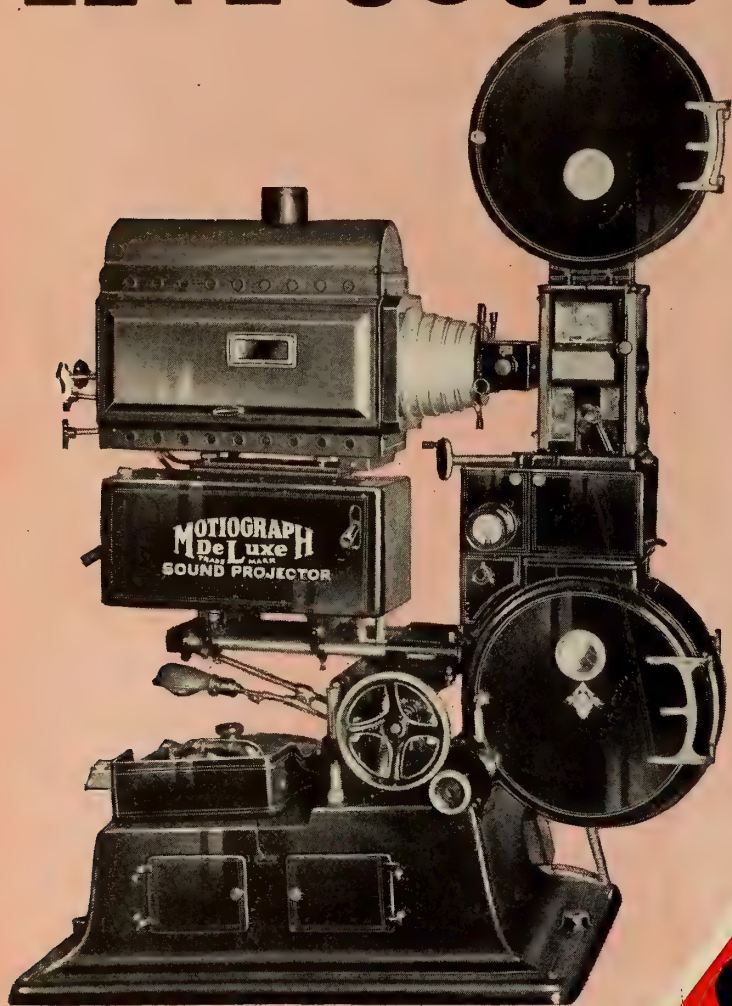
tionist or house manager can afford to do without.



**NATIONAL THEATRE  
SUPPLY COMPANY**  
*Branches in all Principal Cities*



# MOTIOGRAPH DE LUXE COMPLETE SOUND EQUIPMENT



MODEL H MOTIOGRAPH DE LUXE SOUND PROJECTOR FOR REPRODUCING SOUND FROM FILM AND FROM DISC.

UNIFIED CONSTRUCTION.

ALL SOUND REPRODUCING ELEMENTS BUILT IN AS INTEGRAL PARTS OF THE COMPLETE SOUND PROJECTOR.

NO WEEKLY SERVICE CHARGE

MOTIOGRAPH DE LUXE COMPLETE SOUND PROJECTOR EQUIPMENT INCLUDES LATEST NEW DEVELOPMENTS FOR REPRODUCING SOUND WITH DISTINCTIVE BRILLIANCY OF TONE QUALITY, TIMBRE AND NATURALNESS.



MODEL F MOTIOGRAPH DE LUXE SOUND PROJECTOR FOR REPRODUCING SOUND FROM FILM ONLY.

ENTERPRISE OPTICAL MFG. CO., 564 W. Randolph Street, Chicago, Ill.

**GUARANTEED SOUND EQUIPMENT**



# MOTION PICTURE PROJECTIONIST

(Fourth Year of Publication)

ILEX F:2.5

DUAL FOCUS

**T**RULY a remarkable projection lens, this Ilex F:2.5 Dual Focus type projects sound-on-film to cover the same size screen area as sound-on-disc, holding images in true proportion without distortion.

**M**AXIMUM sharpness of definition, brilliant illumination with contrasty coal blacks and snow whites, and flatness of field are Ilex characteristics.



**A**DAPTED for use on all makes of projectors, this lens, by a shift of the lever reduces the changeover operation to a minimum.

PROJECTION

ILEX OPTICAL COMPANY  
ROCHESTER NEW YORK

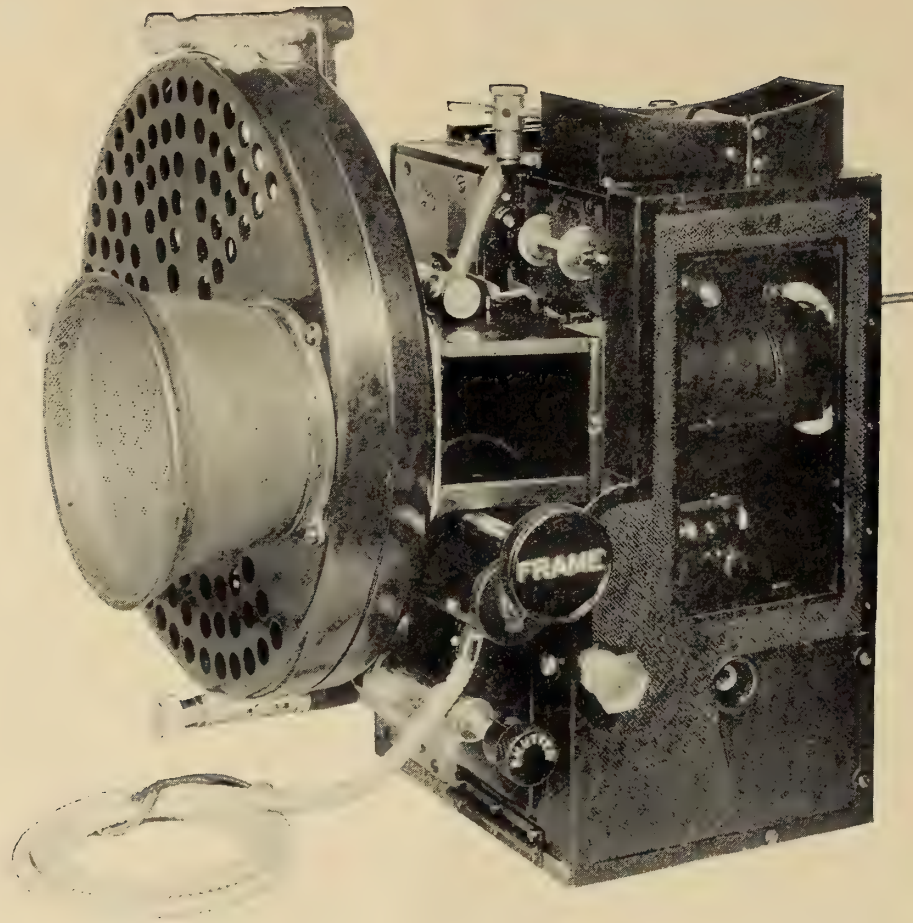
INSIST UPON ILEX  
AND BE PATRON INSURED

LENS



*Now Ready!*

# KAPLAN REAR SHUTTER



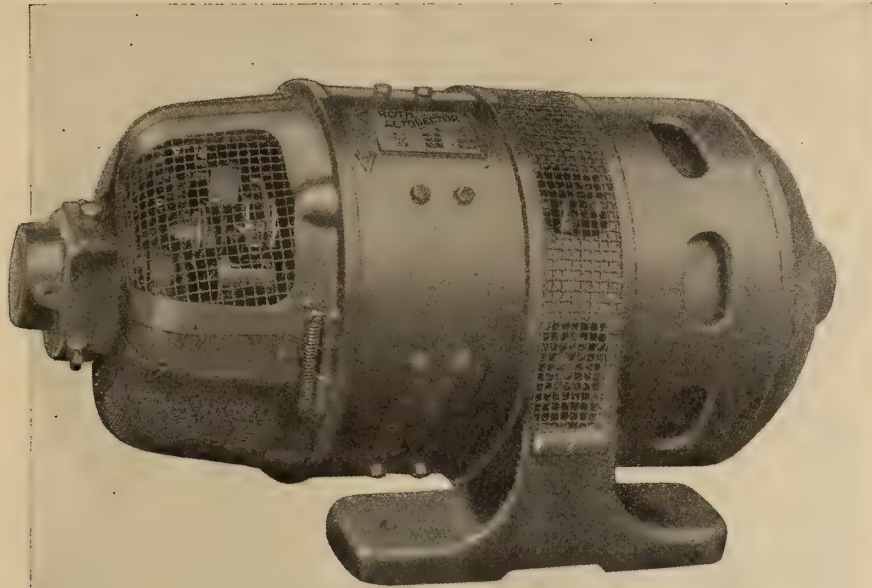
Can be Attached to Any Sure-Fit  
or Simplex Mechanism

*See your local dealer or write to us*

Sam Kaplan Manufacturing and Supply Company, Inc.  
729 Seventh Avenue New York City



# THEY KEEP A-RUNNING



20/40 to 100/200 Ampere 2-Bearing Actodector

## MULTIPLE ARC OPERATION

### ROTH Emergency Lighting Plants

are giving thoroughly dependable satisfaction in many of the largest circuit and independent theatres.

The steady, even power supplied to motion picture projection arcs by Roth Multiple Arc Actodectors results in a uniformly brilliant and intense screen illumination. Any number of arcs can be carried within their ampere ratings—20 to 600 amperes . . . Because of their quiet operation they are particularly suitable for use with sound equipment . . . Furnished in 2- and 4-bearing types.

## ROTH BROTHERS AND COMPANY

*Division of Century Electric Company*

1400 W. Adams St.

Chicago, Ill.

*Distributors and Offices in all Principal Cities*

ACDC-3

DIRECT CURRENT  
MOTORS AND  
GENERATORS



MOTOR GENERA-  
TOR SETS AND RO-  
TARY CONVERTORS



# T O D A Y

And For Over  
Fifteen Years

*Simplex*  
TRADE MARK REG'D.

Projectors  
Have Created and  
Maintained World's  
Standards

Maintaining Quality Is True Economy

*Simplex*  
*The International Projector*  
For Better Projection

Better Projection Pays

THREE PROJECTORS  
or  
Emergency Equipment  
Kept in A1 Condition  
Is a Sure Indication  
of  
Practical - Progressive  
Showmanship

*Simplex*  
*The International Projector*

## International Projector Corporation

90 Gold Street

New York



# MOTION PICTURE PROJECTIONIST

March, 1931

Vol. 4, No. 5

JAMES J. FINN, Editor

Lester Isaac, *Efficiency*; J. H. Kurlander, *Light*; Arthur Gray, *Conservation*; J. E. Robin, *Equipment*; Samuel Wein, *Research*; R. H. McCullough, *Sound Projection*; Harry Rubin, *Improvement*; Victor Welman, *Personnel*; Sidney Burton, *Production*.

Published monthly by Mancall Publishing Corp., 45 West 45th St., New York City. Subscription rates in U. S. and Canada: twenty-five cents per copy; two dollars per year; three dollars for two years. Add one dollar for foreign postage. Changes of address should be submitted three weeks in advance of publication date to insure receipt of current issue.

Entered as second class matter Oct. 25, 1927, at Post Office, New York, N. Y., under the act of March 3, 1879.

## Canadian Representative

H. N. Elliott, Suite 11, 27 Sherwood Ave., Toronto, Canada.

## Australian Representative

McGill's Agency  
179 and 218 Elizabeth St.  
Melbourne, Australia

## Editorial and Advertising Offices

45 West 45th St.  
New York City



## Consolidate ERPI Field Forces

Consolidation of all field forces of Electrical Research Products is under way, according to a statement issued by H. M. Wilcox, Vice President in charge of operation. The first step in the merging of departments was effected February 1 when the Installation and Service Departments were consolidated. "The increasing variety of activities which the Installation and Service Departments are being called upon to handle has made it desirable in the interest of greater flexibility to consolidate the field forces and to rearrange territories so that the sales, credit and operating divisions will synchronize, thereby effecting an even closer coordination," stated Wilcox.

In the consolidation of Service and Installation, the two departments become the Operating Department with J. S. Ward, formerly Service Manager, appointed Director of Operations, reporting to Wilcox; and L. W. Conrow, formerly Installation Manager, becomes Operating Manager, reporting to Ward. The four Installation Divisions and thirteen Service Divisions will be consolidated into five Operating Divisions each under the administration of a manager.

## GREATER BEAUTY FOR THE SOUND SCREEN ..

.. at no extra cost

HERE is a series of tinted positive films that fit the modern motion picture. They are specially designed to reproduce sound with utmost fidelity, but they do even more than this. Wherever they are used .... in newsreel, short, or feature .... they lend a subtle charm, a new beauty not present in the tints of the pre-sound era. Yet Sonochrome Films, an exclusively Eastman achievement, cost no more than ordinary black-and-white positive. Eastman Kodak Company, Rochester, New York (J. E. Brulatour, Inc., Distributors, New York, Chicago, Hollywood).

## EASTMAN SONOCHROME TINTED POSITIVE FILMS

## For Perfect Projection

use

## S.O.G. IGNAL Condensers

Highly polished — Will not Discolor  
Throw an Even White Light on the Screen

Full Particulars

## FISH-SCHURMAN CORPORATION

45 West 45th St.  
New York City

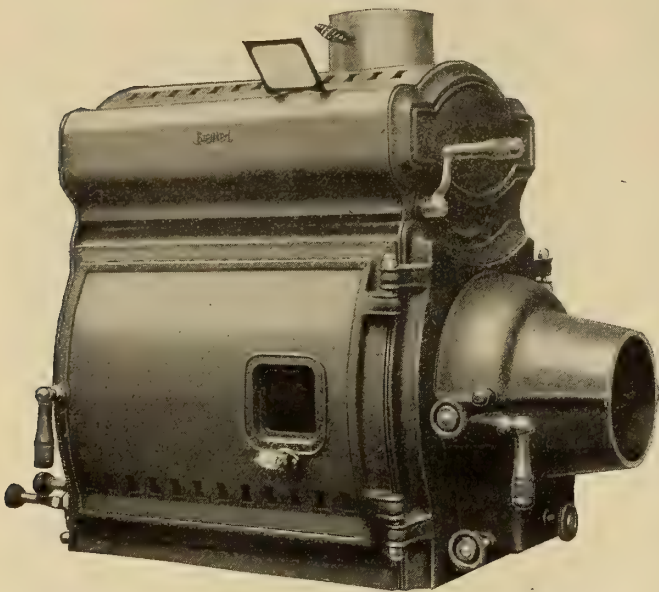
6364 Santa Monica Blvd.  
Hollywood, Calif.



# INSTALLATIONS

have **PROVEN Superiority of**

# Brenkert



## SUPER HIGH INTENSITY PROJECTION LAMP

This new **BRENKERT Super Lamp** Assures  
Higher Efficiency, More Accurate Operation,  
Greater Convenience and Less Maintenance.

**YOUR THEATRE CAN PROFIT BY THESE ADVANTAGES  
ASK ANY BRENKERT USER**

WRITE FOR CATALOG AND NAME OF NEAREST DEALER



CORRECT DESIGN—PRECISION CONSTRUCTION

**BRENKERT LIGHT PROJECTION CO.**

Engineers & Manufacturers

ST. AUBIN AT EAST GRAND BLVD., DETROIT

# PROJECTIONISTS!



Read  
how many  
ways **THIS TEST SET**  
**CAN HELP YOU**!

SEND for your Copy of Instructions on how to use  
**Weston Model 566**—the new test set that every  
projectionist needs to properly take care of his Sound  
Equipment. Amplifier tubes, speaker-coils, batteries  
and the vast number of electrical circuits in Sound  
Equipment must be checked at regular intervals to  
assure continuous and satisfactory performance.

Weston Model 566 is a compact, light, relatively in-  
expensive test set, designed to help you keep a reli-  
able and accurate check on your Sound Apparatus.

Model 566 is typically Weston. It possesses the re-  
finements in design, ruggedness in construction, and  
reliability in operation that has made Weston instru-  
ments the world's highest standard of quality elec-  
trical testing instruments.

*Write for your Copy of Instructions today!*



**WESTON ELECTRICAL INSTRUMENT CORP.**  
617 Frelinghuysen Avenue Newark, N. J.



# The Show

## . . . . MUST Go On

**F**ROM the beginning of the motion picture industry, on through the many stages of rapid development, National Carbon Company research engineers have kept in mind that unwritten law of the theatre—the show *must* go on. That is why National Projector Carbons are dependable.

Larger theatres, longer throw, sound, color and wide film have each, in turn, made their demands. Each new development has called for greater volume of illumination, for higher current through these slender pencils of carbon, for more intense crater brilliancy.

Extensive research and constant improvement in manufacturing methods have enabled National Projector Carbons to meet each new demand. Their brilliant white light provides a quality of projection that pleases the most critical patron. Their steady burning is a source of satisfaction to the projectionist. Their uniform quality gives assurance that *the show WILL go on.*



*National Carbon Company will gladly cooperate with the producer, exhibitor, machine manufacturer or projectionist on any problem involving light. . . .*

**NATIONAL CARBON COMPANY, INC.**

Carbon Sales Division      Cleveland, Ohio

Unit of Union Carbide  and Carbon Corporation

Branch Sales Offices:    New York    Pittsburgh    Chicago    San Francisco



# ASHCRAFT

## AIRBLAST HIGH INTENSITY

# PROJECTION LAMP

Arc Image visible  
from both side of  
lamp.

Forced Draft removes  
all ash from lamp-  
house.

### EQUALIZED CONTACTS

Two on each side. Require no  
attention. Cannot oxydize or  
pit. Protected from heat  
of the arc.

Pyrex Mirror  
cooled by  
Air Circulation

### AIR COOLING

Allows higher current to be used.  
Ordinary oil used as lubricant.  
Absolutely prevents overheating.  
Keeps entire lamp clean and cool.

Automatic  
Striker  
fully enclosed.  
Powerful and  
dependable.

Separate Positive  
and Negative  
carbon feed  
adjustments.

### REMOVABLE ELEMENT

Entire mechanism slides out rear  
of housing without use of tools,  
making it very accessible for  
care or inspection.

MECHANISM COVER REMOVED

## THE AIRBLAST LAMP

Produces an abundance of light for even the largest screens with  
a current of only 85 amperes, together with the greatest economy.

*Fully described in our bulletin which is now available*

### ASHCRAFT AUTOMATIC ARC CO.

4214 Santa Monica Blvd.

Hollywood, Calif.

### ALL PARTS ENCLOSED

All wires, connections, gears  
and bearings placed in air blast.  
Mechanism will not retain  
ash and dirt.

Carbon Release  
operates outside  
of lamphouse.  
Closes automati-  
cally with door.



# The Elements of Optics

By SIEGFRIED S. MEYERS †

## IV

**T**HIS earth would be an unpleasant place to live in were it not for the fact that human vision is able to appreciate light in terms of color. Suppose everything that the human eye could see were not colored, but merely shaded with various depth of gray. We could hardly recognize one face from another, one traffic light from another, one anything from any other thing. Fortunately for us such is not the case, but there is much doubt regarding the ability of the lower animals to see things in color. Sir Isaac Newton was the first to explain that white light, like that from the sun, is composed of various colors. His experiment to prove this is well known, namely, the passing of a narrow pencil of white light through a triangular glass prism, and the resultant dispersion of the white light into its constituent colors. The reason for such dispersion is readily explained from the wave theory of light, namely, that light is a wave motion, and white light is a group of wave motions which travel through the ether at a velocity of 186,242 miles per second.

According to our understanding of refractions, a ray of light which enters a more dense medium obliquely is slowed up, the amount of retardation depending upon the length of the wave in question, and upon the optical density of the medium through which it passes. We know that the ray is retarded, because we can see that it is bent. Each ray of white light is bent in accordance with its particular wave-length, and the resulting light produces the spectrum. The spectrum consists primarily of three colors—red, yellow, and blue. Of course, the spectrum is said to be composed of seven colors, but the re-

† Instructor of Physics, Stuyvesant High School, New York City.



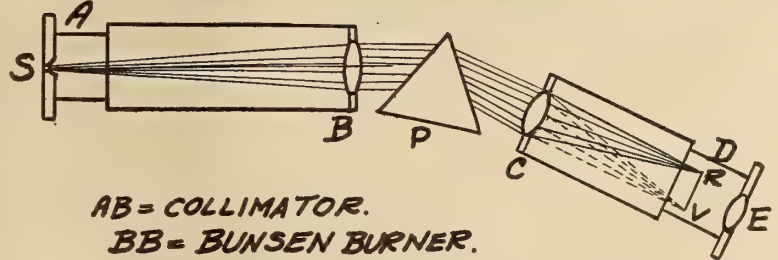
Figure 1

maining shades like violet, indigo, green and orange are more or less resultant or overlapping hues.

### The Spectroscope

The spectroscope is an optical device used by Bunsen as early as 1859 for the purpose of determining the chemical constituents of various substances. Referring to Figure 1, a source of monochromatic light, like that produced when a piece of fused table salt is placed in a bunsen flame, is placed before a narrow slit which admits light through a collimator to one face of a triangular prism. This light, which is yellow, is refracted by the prism in the usual way, and is then allowed to be observed in an optical telescope. Since white light is dispersed upon passing through a triangular prism, it is apparent that each color of light is bent differently, the violet being bent the most, and the red being bent the least. Now, when table salt is vaporized in a flame, yellow light appears, which passes through the prism at a certain angle, depending on the wave-length

## THE SPECTROSCOPE.



AB = COLLIMATOR.

BB = BUNSEN BURNER.

C = CONVERGING LENS.

RV = SPECTRUM FROM RED TO VIOLET.

CD = MICROSCOPE TUBE.

E = SIMPLE MICROSCOPE.

P = TRIANGULAR PRISM.

S = SLIT.

of the particular light in question.

Suppose we substitute some other substance, such as lithium chloride. When placed in the bunsen flame this substance gives off two bands of light, one yellow and the other red. When calcium chloride is used we get a yellow band and a green band. Thus, we have an optical device which utilizes a prism and a lens for the purpose of determining the color of any substance. Charts are available which definitely indicate the color of the spectrum produced by all the known chemical substances. The sun gives us the solar spectrum which is comparable with the rainbow after a shower in the summer time. Therefore, we may conclude that each color coming from the sun must be due to some gaseous vapor on the sun which represents a given substance. It was by spectral analysis that helium was discovered on the sun, and its resulting recognition here on earth.

### Color Due to Thin Films

Very frequently it has been observed that oil possesses beautiful

## THE LUMINOUS FOUNTAIN.

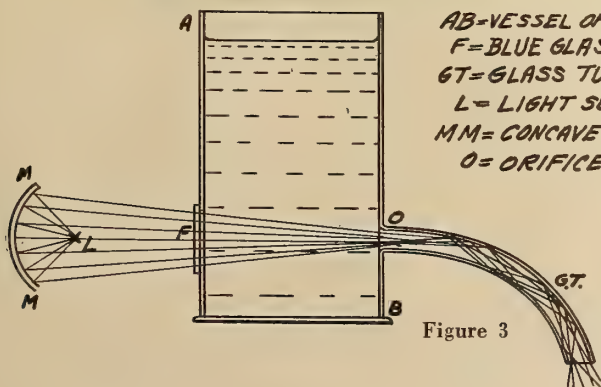


Figure 3

AB = VESSEL OF WATER  
F = BLUE GLASS FILTER.  
GT = GLASS TUBE.  
L = LIGHT SOURCE  
MM = CONCAVE MIRROR.  
O = ORIFICE.

## INTERFERENCE FROM THIN FILMS.

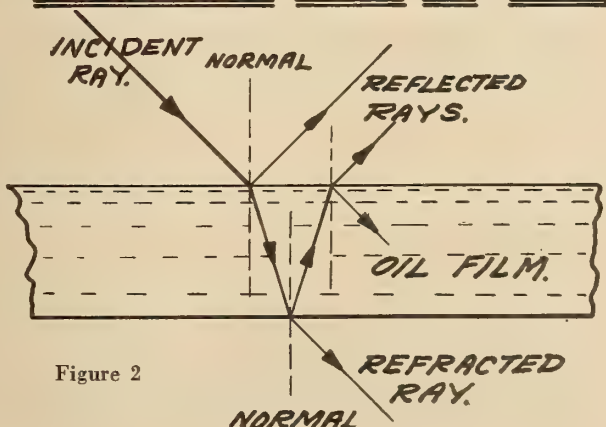


Figure 2



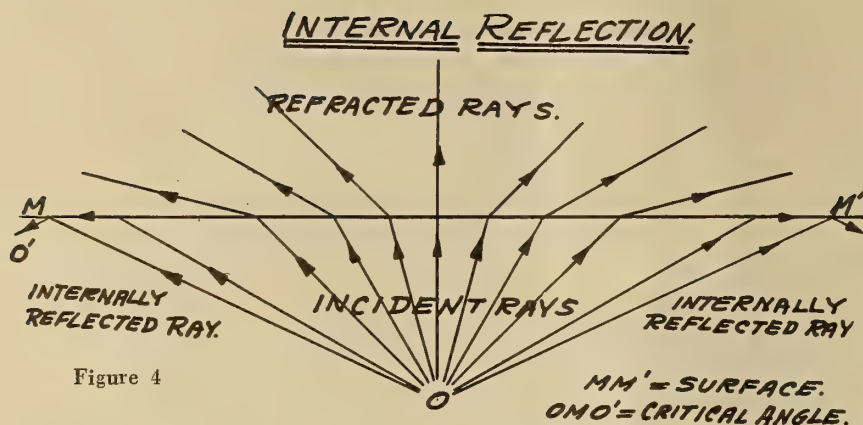


Figure 4

colors when placed in the sunlight. An observer watching a child making soap bubbles notices the gorgeous colors produced as the bubble rises and glistens in the sunlight. Those of us who have dealt with molten metals like lead, certainly could not have failed to notice the various colors of the spectrum. But why we see these colors is a matter of simple explanation.

In the first place, suppose we took two tuning forks having a slightly different vibration rate and struck them simultaneously. The result would be a sound corresponding to the rate of one of the forks together with a superimposed throbbing of sound. Such a phenomenon is known as interference. When the crests of two sound waves coincide we have an increase in audible intensity; and when the crest of one wave and the trough of another coincide, they neutralize each other and we have silence. A rapid succession of these produces beats.

Returning to light, each color of the spectrum has its own characteristic frequency or rate of vibration. Now, when sunlight strikes the surface of a very thin film of oil or soap bubble or film of a metallic oxide, two things happen to the ray (Fig. 2).

#### Color of Transparent Bodies

In the first place, a ray of light passing obliquely through space and striking a smooth surface like an oil film, is reflected in accordance with the law of reflection. But, since oil is also transparent, part of the incident ray which was reflected from the outer oil surface passes through the oil to the lower surface. At the lower surface part goes through and part is reflected in accordance with the law of reflection. This reflected portion passes upward through the upper surface of the oil, and by virtue of its longer path interferes with the reflected portion of the original incident ray at the upper surface. This interference neutralizes some or many of the original wave-lengths of which the incident white light was composed, resulting in a color produced by the surviving wave-length of light. In soap bubbles and in thin metallic oxides the same interference

effect takes place producing various colors, depending upon the thickness of these oil films.

If a piece of red glass is held before the eyes everything appears red. If a piece of green glass is substituted, everything appears green. The reason for this is simple. Since we know that white light is composed of all colors of the spectrum, we may consider the red glass as being composed of such chemical pigment as to absorb all the colors of the spectrum except red. Since it does not absorb red, everything which sends light to the red glass will appear red, because all the other colors have been absorbed. Similarly, the green glass offers a barrier to all colors except green which color it transmits. The result is a view of green.

Referring to Fig. 3, a luminous fountain is sketched. This fountain consists primarily of a source of white light which has a colored filter placed before it. The colored light, blue for example, passes through the water, because blue glass absorbs all colors except blue, and is transmitted through the vessel to the orifice in its side. As the water proceeds from the opening it appears to be colored blue because of the internal reflection of light. By internal reflection of light is meant reflection of light internally because the incident ray has exceeded an angle which no longer permits light to be refracted through it (Fig. 4). If a source of light were to be directed upon a smooth surface of water, the light would experience a bending because of the law of refraction. But, as we incline the source more obliquely, we arrive at a critical angle where the light is no longer refracted, but rather is reflected from the surface. Similarly, in the luminous fountain certain rays of light strike the inner surface of the issuing stream at or beyond the critical angle, resulting in internal reflection which causes the stream to appear as though blue water is issuing from it.

#### Color of Opaque Bodies

Opaque bodies owe their colors to the wave-length of the light which they reflect. All the wave-lengths of white light are absorbed by a piece of green cloth, except green. This

color is reflected and we see it as green. Similarly with red, blue, yellow, and all the others. Those colors which are absorbed are consumed in the form of heat. Hence, every opaque body is visible by virtue of the wave-length of light which it reflects to the eye. If we were to hold a piece of green cloth in a room which is flooded with red light, we should be unable to recognize the color, for the green cloth absorbs all the red but has no green light to reflect. Thus we see it as a dark body.

If we were to mount a disc upon a stand so that it might be turned by a crank, and if we painted all the colors of the spectrum on its surface, we should observe a light gray effect upon rotating the disc (Fig. 5). This bears out the point that all the colors of the spectrum blend into a single white light, and experiment actually proves it when the colors are carefully selected. Similarly, Fig. 6 shows a Von Nardroff Color Mixer which mixes the three primary colors—red, green, and blue—and projects them all upon a screen. The resulting color is white, proving that white light is composed essentially of the primary colors plus the remaining colors which serve to fill the intervening spaces between the wave-lengths of these primary colors.

However, if this color mixer were so arranged as to cast three beams, that are differently colored, on the screen, we could use this device as a standard for calibrating color filters. If we should place a green color filter in front of these projected colors successively, we could instantly determine its quality of color, for the filter, if perfect, would show up brilliantly when placed in the green path and would be invisible on the screen when placed before either of the others. Similarly, the true color of opaque bodies can be determined by reflecting these colored beams from their surfaces. Let us suppose the body appears red in ordinary daylight. When placed in the path of the red beam,

#### COLOR DISC.

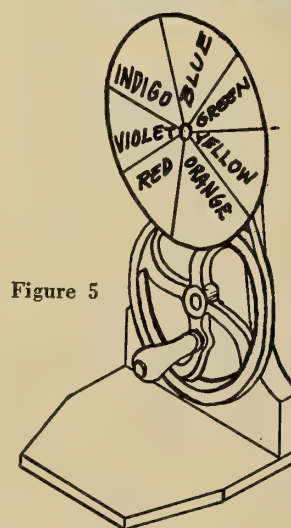
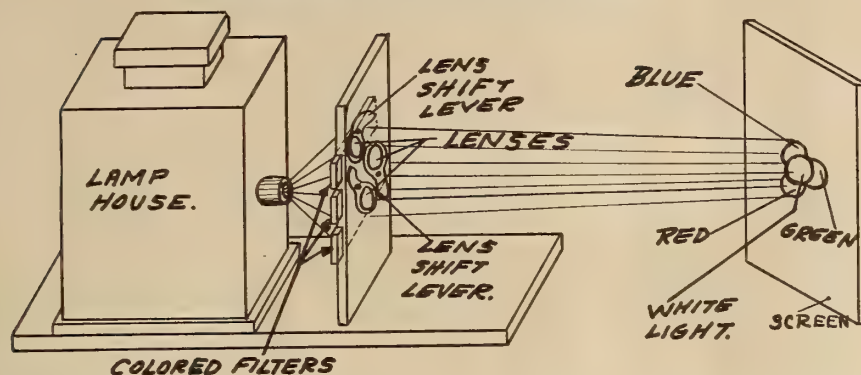


Figure 5



VON NARDROFF COLOR MIXER.

Figure 6



we should be able to distinguish its color as red, but when placed before either of the other colors, we should be unable to distinguish its true color. If, on the other hand, we do not get a test from either of these methods, we can safely conclude that the sample is that of some intermediate hue.

In the careless observer's mind, the false notion exists that the mixing of colored pigments is directly comparable to the mixing of colored lights. It is common experience for a painter to mix blue paint and yellow paint to produce some final pigment like green. But, to try this with colored lights produces a different effect.

Let us consider the color disc in Fig. 5, upon which we can mount two cardboard semi-circles, one colored blue and the other colored a particular

hue of yellow. Upon rotating both semi-circles at a speed which slightly exceeds the limit for persistence of vision, the result would be a gray rather than a green. The explanation of this is psychological. Since certain regions of our retinas are sensitive to particular colors, we fatigue the nerve-endings that are sensitive to that color. Now, since we see each color for an equal length of time, the nerve-endings for these colors become equally fatigued, resulting in a gray effect. Returning to mixing pigments, on the other hand, the reason for the resultant green is due to reflection back and forth between the differently colored particles, which results in the absorption by the opposite pigments of many of the colored rays, and leaves a single wave-length which produces the visual sensation of green.

## Eastman New-Type 'Fast' Film

A NEW type of motion picture film, about three times as "fast" as that previously in use, has been announced by the Eastman Kodak Company and has been demonstrated to a group of leading cameramen and laboratory technicians. The new film is expected to work marked changes in studio technique, by permitting greater freedom in making sound pictures and by cutting down the necessary amount of lighting, thus reducing heat, glare, and cost. The faster film is described by motion picture engineers as the greatest advance in motion picture materials since the introduction of panchromatic film eighteen years ago. The motion picture industry, subsequent to that development, went over almost entirely to panchromatic film, which, in monochrome, portrays colors in their proper tonal relation to each other instead of with distorted values.

The new type of film was announced as possessing increased panchromatic qualities in addition to its greatly increased "speed." Increased speed, in cinematographic terminology, means simply the ability to expose a photographic image with less light. Since the advent of sound in motion pictures three years ago, the Eastman Kodak Research Laboratories have experi-

mented in the direction of developing a film to meet present conditions in the sound studios, where the substitution of incandescent lighting for electric arcs presented a new photochemical problem.

The panchromatic film heretofore in use was developed for exposure with arc lighting. When the change to incandescent illumination swept over Hollywood, the film was adapted to the new conditions so far as that was then possible. The new type of film, on the other hand, was specially made for use with the "inkies," as Hollywood calls incandescent lights, and has a sensitivity to red and green hitherto undreamed of. Incandescent light contains a higher proportion of red than does the light from arcs.

The increased speed and extraordinary color sensitivity of the new film are expected to be of particular usefulness in natural color photography, where the great concentration of light hitherto necessary has been a drawback.

Another practical advantage claimed for the supersensitive film by Eastman representatives here is an increase in the possible "depth of focus" in sound film photography. The use of incandescent lighting made desirable the wider opening of lens

diaphragms to let additional light into the cameras. This, in turn, by a law of optics, greatly diminished the range within which the actors could move and yet remain in focus. When sound came to the movies, depth of focus became of increasing importance because it is irritating to audiences to hear a clear voice coming from an out-of-focus actor.

With the greatly increased speed of the new film, it will henceforth be possible to "stop-down" lenses, increasing the depth of focus and thus permitting greater latitude to directors in moving their actors about before the camera. The characters will no longer have to remain in a narrow plane at a fixed distance from the lens under penalty of blurring into the background or becoming fuzzy in the foreground.

An alternative advantage of the new type of film is the possibility of reducing the amount of light to one-half or one-third the present quantity necessary for sound picture cinematography. In practice, it is expected that the studios will compromise between the maximum reduction of lighting and the maximum gain in depth of focus, taking partial advantage of both benefits offered by the new type of material.

A further characteristic of super-sensitive panchromatic film is the greater ability it will give newsreel cameramen to make pictures under difficult conditions, both at night and in daylight insufficient to make clear pictures on film of the speeds previously in use. Prize fight pictures, taken under incandescent lights, will be better, and previously impossible indoor action scenes like hockey games and basketball games will become possible. Successful motion pictures of action on a theatre stage, photographed from the balcony, were made during the tests that preceded announcement of the film—a feat considered difficult.

Decided "development latitude," minimizing the danger of making films "chalky" or "over-contrasty" in processing, is cited as an additional quality of the new film.

The sensitive "emulsion" of the new film is very closely related to one prepared for astronomical photography, as well as to super-speed panchromatic plates put into use by newspaper photographers during the past few months for action photography under artificial lights. This fact was revealed by Dr. C. E. Kenneth Mees, director of the Eastman Kodak Company in charge of Research and Development. Astronomers, it has been learned, used the new emulsion recently in making observations seeking to discover whether there is water in the atmosphere of Mars.

The necessary time for exposing plates in the spectroscope was reduced from ten hours to four in the observations in question.



# Ground Noise Reduction (R.C.A. Photophone System)<sup>1</sup>

By RALPH H. TOWNSEND and HUGH McDOWELL, JR.

*These contributions of Messrs. Townsend and McDowell are two of a series of three papers which were read before a meeting of the Technicians Branch, Academy of M. P. Arts and Sciences on January 7th, last. Space limitations prevent the inclusion in this issue of the third paper of the series (a contribution by Mr. L. E. Clark), which will be presented in the next issue.—Editor.*

## Section A

By Ralph H. Townsend

EVER since Thomas Edison made his first sound recording on a piece of tinfoil, reproduced sounds have been what we might call "victims of circumstances." This is true not only of phonograph disc reproduction but that from film as well. Always has the listener been compelled to hear reproduced sounds of speech and music accompanied by needle scratch or extraneous background noises of various sorts.

In phonography this ever present background noise was and still is a source of untoward disturbance and annoyance. It has been reduced somewhat by careful attention to the many processes involved in record production. For instance, the wax on which the original recording is made has a homogeneity and uniformity undreamed of in the early days of the art. Electrolytic copper anodes, carefully prepared solutions, and accurate timing and temperature control now produce from the master record a copper plating of almost microscopic smoothness. The plastic compounds from which commercial records are pressed have been improved and refined to a remarkable degree.

But in spite of all this we still have needle scratch or surface noise to contend with.

### Trouble Above 5,000 Cycles

With the advent of electrical recording the useful frequency range was greatly expanded. Electrical reproduction was capable of taking off the record all that was on it including surface noise and then what did we do? We found by analysis and measurement that a great deal although not all of the disturbance from background noise lay in the frequency range above 5,000 cycles. Electrical filters being easily constructed we then proceeded to cut off by means of a low-pass filter everything above about 4,500 cycles. The surface noise disappeared to a considerable degree

but so did most of the higher frequencies we had worked so long and diligently to include in our recordings. However the ground noise was reduced, and that was what we set out to do, hence the experiment was a success.

The use of film as a medium on which to record sounds involved all of the trouble heretofore encountered in disc recording and reproduction. As a matter of fact there is a striking similarity between the processes. Instead of granular wax we now have to contend with emulsion grain; instead of graphiting, plating and pressing we have developing and printing; instead of a plastic shellac compound we have another piece of positive film stock as a final record; instead of defective phonograph needles which do not fit the grooves we have light slits which get out of focus.

You are no doubt all quite familiar with the reasons why ground noise interferes with reproduction and there is no necessity for a discussion of that particular point. If there were no ground noise or extraneous sound disturbances speech and music would be clearer—we will all admit that. The question is how can the ground noise be kept out or removed without interfering in any way with the wanted sounds or frequencies.

Mr. C. R. Hanna of the Westinghouse Company and Mr. C. W. Hewlett of the General Electric Company in the early part of 1929 did considerable thinking and research on this problem and at that time devised ways and means of accomplishing

such an end. So far as we know Hanna's method is the basis of all those used commercially today.

Before we go further suppose we consider for just a few moments what ground noise is. A general definition would probably run something like this. "Ground noise is all sound evident in reproduction which was not present in the original sounds." You have all sat in theatres and heard this type of disturbance but probably few of you have taken the trouble to try and analyze this background noise. It has been analyzed, however, and found to consist of disturbances from many different sources.

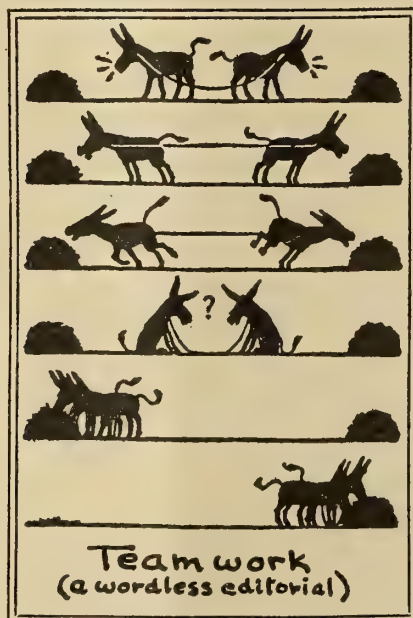
### Sources of Noise

For instance during a take on a stage or set it is almost a physical impossibility to have perfect quiet. There is always a certain amount of set noise due to movement on the part of the many people who are on the set at the time, the cracking of arc lamp housings or incandescent lamp housings, noise due to the cameras and their driving motors, to say nothing of a certain amount of noise which is caused by traffic outside the studio or extraneous disturbances in adjoining studios.

The next source of noise is located in the microphones and their associated amplifiers. No matter how carefully an amplifier is constructed we always find a certain amount of noise due to circuit conditions and tube characteristics.

If we add all of the components of noise mentioned above we find that up to the film we have a total noise level which may and often does assume considerable proportions. In some instances actual measurements indicate that this noise level is as high as 20 db. Since all of these disturbances are included in the signal fed to the recording mechanism, whether it be an aeo light, light valve, or vibrator, all of them make their impression in the resulting sound track on the film. Every film on which recording is made has a certain definite resolving power, that is, the ability to respond evenly to exposure. The emulsion on film which is susceptible to the action of light and development is a very sensitive medium. For this reason it is very desirable that it be treated with respect.

It is not reasonable to suppose that we can subject a film to under exposure and over development or over exposure and under development and get uniformity throughout the resulting opaque portions. In other words, unless the exposure and development is carried out with precision there is



<sup>1</sup>A paper from the Technical Digest Service, Academy of M. P. Arts and Sciences. Copyright, 1931, by the Academy.



great possibility that the resulting granular structure will be a source of disturbance later on.

During the developing, washing, and fixing of film there are plenty of opportunities, even in a well-ordered laboratory, for the film to pick up small particles of dirt. By small I do not mean particles of a size visible to the naked eye. These particles may be, and usually are, microscopic in size. Their ability to produce noise, however, is still considerable.

The handling of film, that is, of negative film and also of the positive stock, during the printing operation is another potential source of noise. The developing and drying of the positive print is still another source.

You may well ask at this point how can the disturbance, due to a recorded sound track combine with dirt and make more disturbance. If you will consider for a moment the manner in which a sound track on film is reproduced as sound the answer will be quite evident.

### Influence on Reproduction

Most reproduction from film is accomplished by interposing the recorded film between a source of light and a photoelectric cell. The intensity and amount of light may be considered as fixed, consequently any change in the opacity or width of the sound track as it passes through the light beam will cause a variation in the current through the photocell. The output of any given cell varies directly with the amount of light change and is independent of the rate of light change. This being true it makes no difference whatever to a photocell whether the light is cut off or varied by means of a sound track variation or by specks of dirt or foreign matter on the surface of the film.

You will be shown later what a variable area sound track looks like and will note, too, why we are not particularly interested in varying density.<sup>2</sup> In normal variable area recording the sound track is always made up of equal portions of exposed and clear film.

Any dirt or foreign matter getting on the exposed or dark side of the track would have no effect whatever but should it get on to the clear side its presence would be noticed as noise in the reproduction. The reason for this is evident. Dirt is opaque and the dark side of the track is nearly so, but dirt on the clear portion would cause a change in the amount of light falling on the photocell and produce noise.

At normal gain settings during reproduction, the ease with which wanted sounds can be heard depends on the ratio of the recorded sounds to the ground noise level. In other words, if the modulation during recording was low i.e.: of the order of say 10 or 15% and we accumulated a little noise from each of the sources

mentioned a few minutes ago we would find it difficult to distinguish speech or music above the noise level.

## Hanna-Hewlett Method

The problem then was how to drop the level of ground noise to a point where it no longer interfered with recorded sounds. Hanna and Hewlett did it by making opaque all that portion of the track not actually occupied by modulation. An obvious and simple solution wasn't it?

Their method was simple and effective too. They merely took a little of the output of the amplifier just before it was fed into the recording mechanism, amplified it, rectified it and used the resulting direct current to furnish what may be termed a secondary control over the vibrator. A detailed description of this method and the circuits involved will follow shortly so it will not be necessary to dwell at length on that point now.

What happens, however, is this. The output from an audio frequency amplifier is in the form of alternating current. The wave shape may or may not be symmetrical but in all cases the current values during any cycle start at zero, increase to a positive maximum, decrease through zero to a negative minimum and then increase again to zero. If these values be plotted and a straight line be drawn through the zero points, this line may be considered as a base line above and below which the current values rise and fall. In RCA Photophone recording this base line corresponds to the center line of our sound track when the vibrator is at rest in its normal position.

Since the vibrator is designed to change its position with respect to this base line under the application of current changes, its position at any instant is determined by the value of the current at that same instant. As the current rises to a positive maximum, the vibrator twists to an extreme position in one direction. As the current falls through zero and

decreases to a negative minimum, so the vibrator twists back through normal to an extreme position in the opposite direction.

Suppose now that some direct current were introduced into this circuit. It would have the effect of shifting the base line about which the vibrations took place to a new position and we would have a new zero line. Current changes and vibrator deflection with respect to the base line would remain the same as before but neither would be the same with respect to the new zero line.

It will be noted that the value of the d c from the rectifier placed across the output of the amplifier is at all times proportional to the strength of the a c signal so we here have an automatic and positive control over this d c component or "bias" if you will. In other words it is necessary only to choose first the new base line for the vibrator setting and second the proper value of the d c to return the vibrator to its heretofore normal position in the center of the sound track. Both are easily obtained and once set the ensuing action is simple, positive and automatic.

Applications of this principle have been made during the past year or more at RKO Studios and Pathe Studios, where a number of productions have been made and released.

The following section by Hugh McDowell from RKO's sound recording staff will explain in detail another modification of this method.

## Section B

*By Hugh McDowell, Jr.*

**D**URING the filming of the RKO production, "Hit the Deck," in September, 1929, musical effects were desired that would produce extremes in volume beyond the range of the normal variable area recording system. At this time, Mr. Carl Dreher, Director of Sound at RKO Studios, mentioned to the writer a system of

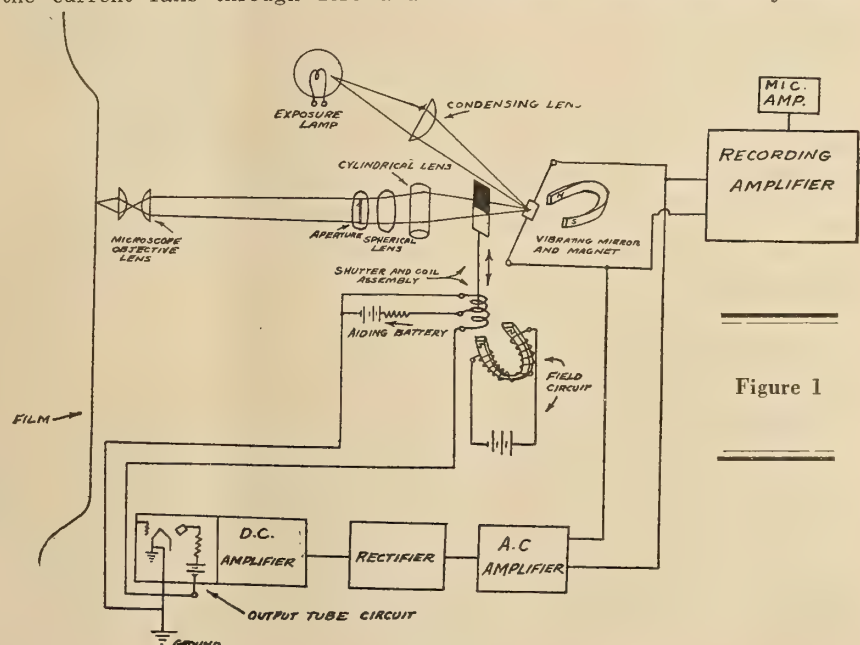


Figure 1

<sup>2</sup>This data is included in the paper by L. E. Clark which will be published in the next issue.



recording devised by Mr. C. R. Hanna, of the Research Laboratory of the Westinghouse Electric & Manufacturing Company, for the purpose of eliminating ground noise and consequently permitting greater volume spread.

The writer was much impressed by the principle that Mr. Hanna had made use of, namely, eliminating the unused clear portion of the sound track in the variable area method of recording, and proposed further investigation. The objection was raised, however, that as this system displaced the position of the sound track at minimum modulation to the edge of the film, it was of doubtful utility in commercial projection machines, as any weave in the film in its travel might cause it to lose contact with the scanning beam during intervals of low modulation. The writer thereupon set about devising a system which would retain the advantages of Mr. Hanna's, but would keep the sound track at all times in the center of the seventy mils allotted to it on the film. The writer is also indebted to Mr. C. W. Hewlett, of the General Electric Company, for the use of a portion of his system which is similar to Mr. Hanna's.

#### Two Recording Essentials

Natural sound film recording must meet two essential requirements, namely, good quality of pickup, and range of sound from soft to loud with only a tolerable amount of noise. In standard methods of recording, the former is accomplished, while the latter is restricted to the limiting factor of ground noise caused by the unused clear portion of the emulsion on the film, admitting unnecessary light to the photoelectric cell of the reproducing equipment. As the light reaching the photocell is in effect the carrier of all current within the cell, it is evident that unused clear portions of the film cause the cell to produce energy not required by the legitimate sound, thereby producing extraneous noise in the output.

Noise is also produced by the transparent portion of the film not being totally clear, but containing dirt, scratches, etc., which disturb the carrier in such manner as to cause additional noise, in effect, reproducing the dirt, scratches, etc. It is obvious, therefore, that in the standard method of recording sound volume reaching the film must at all times be adequate to overcome the ground noise factor, which remains constant. This requirement restricts the compass of electrically reproduced music and is an obstacle to natural and effective reproduction.

The remedy for this condition in variable area recording is found in eliminating the clear portion of the film, except at times when the modulation requires it. With this accomplished, it is possible to allow the modulation to fall to its natural minimum and rise to its natural maximum, for with the clear portion of the film

eliminated, ground noise no longer remains a constant quantity, but changes in proportion to the degree of volume.

Roughly, in standard methods of recording, the volume range from minimum to maximum is approximately 20 db., while with the anti-ground noise methods of recording described herein, the volume range may be extended to approximately 35 db.

#### Electrical and Mechanical Design

The following description of the device illustrated in Fig. 1 does not take into account later simplifications in design.

Connected to the output of the recording amplifier is a two-stage amplifier of sufficient power to operate a rectifier tube following. The d c output from the rectifier is then passed on to a direct current amplifier which amplifies the d c impulses of the rectifier, increasing their amplitude to any desired point, by varying the input voltage on the two-stage amplifier. The d c impulses are then fed through one-half of a voice coil of an electrodynamic shutter movement to a resistance and battery of low voltage which aids the flow of current from the plate circuit of the d c amplifier to ground. Across the aiding battery and ground is connected the remaining one-half of the voice coil which is excited by the aiding battery when the normal plate current is depressed, due to rectified modulation.

It is seen, therefore, that two voice coils in series in this manner are excited in such a way as to cause one coil to exert pressure, when excited, in one direction, while the other coil exerts an opposite pressure when excited in the other direction. This balanced circuit of voice coils in the magnetic field causes pressure to be exerted equally and oppositely in both directions, and in opposite phase. To these voice coils is directly attached a moving shutter actuated by the voice coils which is placed mechanically in the beam of light reflected by the vibrating element of the recording system. The shutter, therefore, moves in proportion to the amount of input to the two-stage amplifier, moving outward under pressure of the rectifier and voice coil to accommodate the peaks of the modulation on the film, and moving backward when the modulation decreases, also under pressure of the voice coil. It is obvious, then, that electromagnetic pressure is exerted in both directions in the functioning of the shutter.

The electromagnetic assembly is supported mechanically by a lathe carriage arrangement so that manual adjustments may be made to place the shutter in the proper position with respect to the light beam.

The vibration of the shutter is in exact accordance with the d c impulses of the rectifier, and, therefore, it admits light to the extent required by the peak modulation reaching the film at any given instant. When no modu-

lation occurs, the shutter is adjusted to admit to the film light approximately five thousandths in width as against thirty-five thousandths width for the normal variable area recording system. It is seen by this that there remains about ten per cent of the clear portion of the film that formerly existed. This factor in turn admits only about ten per cent of the light formerly reaching the photoelectric cell in the projector, cutting down overall excitation of the photocell when no sound is in evidence, and consequently reducing extraneous disturbances in the cell.

#### Equipment Used

The equipment used in recording during 1930 consisted of a two-stage amplifier-rectifier and direct current amplifier built in a steel box 18x18x8, internally divided, the partition separating the d c amplifier, from the other units. The two-stage amplifier is operated from a small B-supply working from 50-cycle alternating current and supplying 250 volts to these stages. The direct current amplifier consisted of seven UX-250 tubes in parallel, fed by a 180-volt storage battery. A small meter control box containing two 0-to-500 milliammeters is used with a switch for breaking plate current and aiding battery current to the voice coils.

Each voice coil has connected in series with it a milliammeter indicating the variations of current in each circuit. A variable resistance is also used in series with the battery to adjust its value so as to make the voice coils balance electrically, that is to say, when one is at maximum current, the other is at zero, and *vice-versa*. These meters, therefore, represent the movement of the shutter.

Work on the system described was first started in November, 1929. Practical results were obtained in February, 1930, and the device put into production on Radio Pictures' "Dixiana," in March, 1930. "Dixiana" was released in August, 1930. After further development, the system was again used on Radio Pictures' production "Half Shot at Sunrise," released in September, 1930. Since this time, development has continued with the aim of simplifying and reducing the amount of apparatus necessary and to procure simpler adjustments in operation. The device will continue in use on forthcoming RKO productions.

[Note: A third paper by L. E. Clark which complements the foregoing will be presented in the next issue.]

#### Paramount's New Color Process

Paramount now has in preparation for next year a new three-color additive process which will cut color film costs to 4½ cents a foot, as compared with present price of 8½ cents. This process involves the use of ordinary black and white prints, with the color added by means of a filter mounted in front of the projector.



# New Ashcraft Air-Blast H. I. Lamp

**T**HE high intensity reflector arc, widely used throughout this country and in Canada, is an exceedingly efficient light source. Counteracting its great efficiency is the fact that it has heretofore been more or less in the developmental stage, and although many weak points have been discovered and overcome, there remain certain defects upon the elimination of which there has been practically no work done. These weak points are:

1. Unprotected and imperfect contact shoes which must be cleaned daily and which last a comparatively short time.
2. Unreliable control of arc feeding mechanism, resulting in varying screen illumination.
3. Rapid reflector deterioration, pitting and discoloration of silvered surface.
4. Short life of mechanism parts, caused by the inability to properly maintain lubrication.

A large percentage of these faults may be traced directly to the uncontrolled heat generated by the arc.

In the new Air-Blast Projection Lamp, an entirely new product now being manufactured by the Ashcraft Automatic Arc Co., not only have all of these defects been rectified, but every feature which may improve projection quality or be of convenience to the projectionist has been incorporated, making this lamp all that can be desired for perfect projection.

## Unique Cooling System

Perhaps the outstanding feature of this unusual product is the air cooling system. This is original, as far as projection lamps are concerned, with the Ashcraft Co. The air blast is generated by a silent, powerful blower operated by the arc control motor. By a unique method, the air stream is diverted to all parts of the lamp and housing, lowering the operating temperature to such an extent that a perfect running machine is thereby maintained, entirely removing the destructive effects of the generated heat of the arc.

Not only is the air blast a protective feature, but of more importance is the fact that it provides for a great

increase of illumination by allowing a greater amount of current to be carried in the same diameter of carbon than formerly. Heretofore, lamps of the high intensity reflector type were only designed to operate at 72 amperes when using the 9 mm. electrode. With this type the normal current is 85 amperes, although its operation at 70 amperes is perfect and currents as high as 90 may be used with ease.

The element is particularly noticeable on account of the fact that every working part of the lamp—including contact shoes, carbon feed mechanism, bearings, shafts and gearing, as well as all current carrying leads—are entirely enclosed.

## The Element

The element consists of three parts: positive assembly, negative assembly, and enclosed bed plate. The bed plate carries underneath all of the reduction gearing as well as the mechanism for throwing off the automatic feed and applying the manual operation. Each of the bearings carrying these gears and shafts is provided with suitable oil cups. The gears themselves are lubricated with grease or vaseline. Every gear contained in the mechanism is of steel, hardened and ground. Those gears which are spiral are provided with ball thrust bearings.

Upon the bed plate is mounted the positive and negative assemblies. The forced draft of air passes through a duct located on the lower part of the housing base and passes into the enclosed bed plate where it keeps bearing, gears, and lubricant cool. It then passes through the positive and negative assemblies, over the contact shoes, the feeding mechanism, and the ball bearing, keeping these parts sufficiently cool to touch at any time no matter how long the lamp has been in operation. By keeping these parts cool it also cools the positive electrode the entire length except for that part which projects beyond the baffle plate. In this manner the carbon is prevented from oxidizing and deteriorating within, thus allowing the passage of a great deal more current than was formerly possible.

The striking arrangement is entirely automatic and tilts the entire negative assembly. This action is rapid, but so arranged as not to break the positive crater edge when in the "off" position.

The positive baffle is of heavy construction and is also air cooled. For the convenience of the projectionist in removing the positive carbon a lever is located outside of the lamp house which releases the feeding mechanism and allows the carbon to be withdrawn without the roller friction. This release is automatically returned by the closing of the lamp house door.

## Equalized Contact Shoes

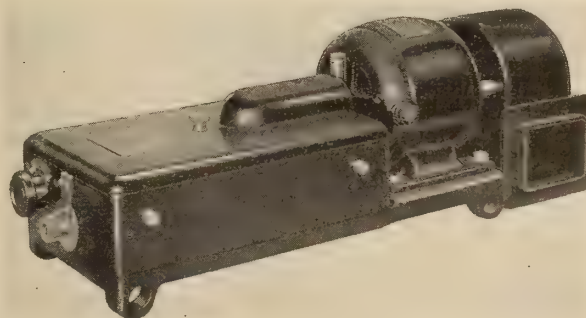
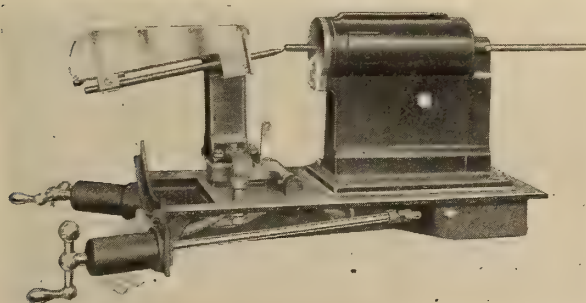
Heretofore contact shoes have been of stereotyped design consisting of two grooved blocks of metal held in contact with the carbon by means of spring tension. A great advance is made in the improvement of this troublesome part by utilizing the equalized multiple contact principle, thereby giving the assembly resiliency and perfect contact at all times. No one would expect to operate a motor or generator by passing 80 amperes through one brush in contact with the commutator without disastrous results, but this is exactly what has been expected of high intensity contact shoes.

The Ashcraft system has doubled the contact area, each shoe so balanced as to present the full area to the carbon. The result is that daily inspection is unnecessary and the life of the contact shoes increased indefinitely. A tough heat-resisting alloy is used, having a smooth polished surface. This surface remains in this condition due to the equalizing and the cooling draught of air which continually passes over the assembly.

## The Arc Control

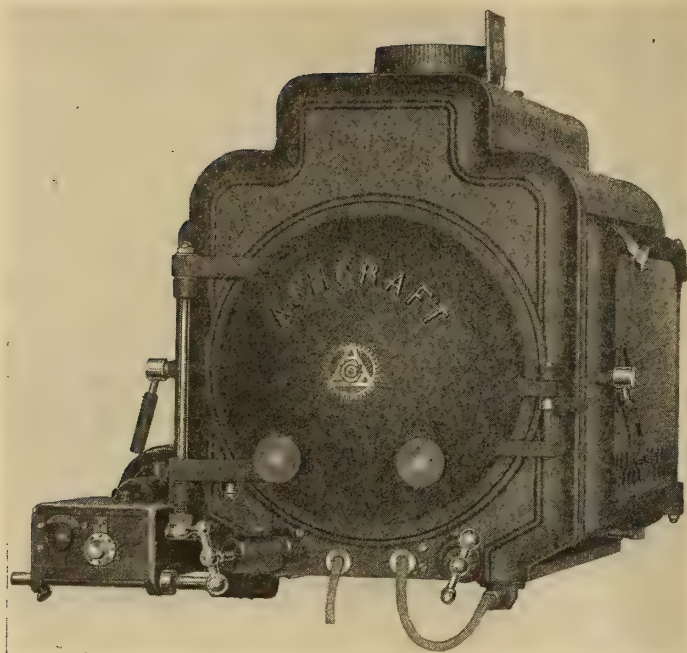
Upon the arc control rests one of the most important duties expected of the projection lamp, that of maintaining a uniform quality and quantity of light upon the screen. No matter how well constructed is the lamp proper, if the arc control does not function properly, poor results will ensue.

The necessary requisites for a per-



Showing two units of new Ashcraft air-blast H-I lamp






---

Showing  
sturdy con-  
struction and  
housing of  
new Ashcraft  
lamp

---

fect arc control are a motor sufficiently powerful to maintain a uniform speed under all conditions; proper regulating means for the motor in order that it may feed the carbons forward slowly, at reduced currents, or rapidly, in the higher ranges; and proper and independent means for regulating the forward travel of the negative, the positive being controlled by the direct motor speed. All of these requisites have been incorporated in the arc control of this lamp; and a motor more powerful than necessary being used, the motor regulation is 1,000 r.p.m. each way from normal and a negative carbon regulation capable of steps that vary the forward speed .0025" at each step.

#### Unit Construction

From the projectionist's standpoint, an improvement of greatest convenience is provided in the unit method of assembly of the lamp. The entire lamp consist of three units: the element, the arc control, and the housing. By simply shifting the arc control  $\frac{1}{4}$ " on the mounting rods and removing the striker link pin, the en-

tire element may be withdrawn from the rear of the housing. This is very convenient for inspection or cleaning.

The removing of the arc control consists of sliding it off the two mounting rods—nothing else. The lamp may be disassembled and assembled complete in one minute.

#### Light Value

One of the first demands made of this lamp was to project a picture 25 x 40 ft. With the ordinary high intensity reflector lamp this result would have been beyond its capacity and quite impossible. The results were exceedingly satisfactory, it not even requiring the full capacity of the lamp to accomplish this. On this screen was used 85 amperes, giving a clear white light entirely unmarred by discoloration which usually accompanies large pictures. This is explained by the fact that in this lamp the intrinsic brilliancy of the positive crater is much greater than in the ordinary high intensity lamp, due to the action of the higher current impressed upon the 9 mm. positive electrode.

## Symposium on Separate Sound Film

THE plan for reproduction of sound from a separate film was the beneficiary of a new impetus with the showing of "Hell's Angels" at the Gaiety and Chinese theatres in Los Angeles last year, but since that time general conditions within the industry have been such as to impede further work on the project. Not the least important factor in the decision to sidetrack the work indefinitely has been the matter of costs not only for the additional film but for the necessary reproducing equipment. Further, a majority of existing projection rooms are so limited in space that the installation of the extra equipment

would not make for desirable operating conditions. A lengthy discussion of this interesting topic was held at the last meeting of the S. M. P. E. in New York City, abstracts from which are appended hereto:

President Crabtree: The matter of obtaining a wide screen picture and better sound reproduction should be freely discussed by our members. To what extent would putting the sound and picture on separate films contribute to these ends? There is no question that the quality of sound reproduction must be considerably im-

proved, especially that of music, if the public is to remain interested very much longer. The reproduction of speech, I think, is quite good, but the quality of music is very poor, in my estimation.

In the average projector the film is subjected to heat, oil, dirt, scratching, and to an intermittent motion, all of which are not conducive to good sound quality. It will be necessary to treat the sound track more carefully in the future if we are going to stimulate orchestral music with any degree of realism. One way of doing this would be to have a separate device for handling the sound track; in other words, a separate machine would be required, wherein the speed of the film could be much higher than at present, aiding in the reproduction of higher frequencies. It would then be a simple matter to obtain smooth motion, and the film would not be subjected to dirt and heat as in the present projector. These possibilities have been pointed out previously at our meetings, but they must not be lost sight of. In the future it may be necessary to use multiple sound tracks. The progress Committee reported that in Hollywood sound has been reproduced simultaneously from two or more identical sound tracks, so that the resultant sound was an integration of the individual effects. I cannot help but feel that in the near future some one may demonstrate that by utilizing two or more sound tracks the entertainment value of the picture can be greatly enhanced, and as soon as that is done, the industry will have to consider it very seriously. Of course, this is looking several years ahead, but that is the duty of this Society.

#### Objections to Method

The main objection to this method is the possibility of lack of synchronism and of mixing up the sound record with the picture record, as has been done on occasion with the disk records. However, there is not the danger of sudden lack of synchronism, such as when the needle jumps out of the groove in a record. The only possibility would be a film break, but I haven't seen a film break in a theater during the past six months.

There are other matters, such as extra cost and difficulty of transportation, but when we remember that to put on a traveling show requires a train load of baggage, and to put on a motion picture show requires only a few pounds of baggage in the form of film, I don't think that the industry should reject a system having ultimate possibilities because of a little extra cost of handling.

There is also the matter of rehearsal. Some theaters advertise a big show two or three weeks in advance, and five minutes before the show the film is delivered at the projection room. The projectionists have no opportunity to rehearse the film so that if an incorrect package is de-



livered, the show cannot be put on.

Sufficient time should be allowed in delivering the film for such a rehearsal; if this were done I believe the possibilities of getting the sound and picture record mixed would be negligible.

Mr. James: While in Chicago, I was fortunate enough to view a demonstration of sound on a magnetized metal base. The demonstration was given in the Hart Theatre on Hart Street. I was skeptical about how long the magnetism would be retained by the metal base but was informed that it had been placed on the base three years ago and had been run one thousand times. The music was beautiful and the speech splendid. I suppose it was a special alloy.

President Crabtree: This is an adaptation of the "telegraphone" which Mr. Taylor discussed at length at our Lake Placid meeting.

Mr. Stern: Through my work in the laboratories I have had considerable experience in developing sound tracks, and long ago came to the conclusion that the treatment of the sound track positives separately from the picture print, as is done in negative recording, would have considerable advantages over the present method. Mr. Crabtree has pointed out many of these advantages in his introduction.

This would aid in regaining the lost space that is now used by the sound track. Moreover, the sound track requires different development in the positive and negative processes. There are three major sound recording systems used by our producing companies: (1) the DeForest and Fox-Case recording systems, in which negative stock is developed in a borax negative bath for a good average contrast; (2) the Western Electric system, in which recording is done on positive stock, developed in a soft positive bath for less contrast; (3) the RCA method, in which recording is also done on positive stock, developed for extreme contrast. By printing these sound tracks on the same positive with the picture it is impossible to give the desired quality of contrast to both the picture and the sound track. As a consequence, the quality of one or the other has to be sacrificed, and it is usually the photographic quality of the picture.

Bearing these facts in mind, and desiring to utilize the entire film for the picture, I designed a means of placing the sound track on a separate film so that the latter might be utilized in the same projection machine with the picture positive.

#### The Stern Process

First, one sound track is printed on 35 mm. positive film in the present-day printing machine. Then, by taking another negative sound track and turning the already once printed positive stock around and running it backward, another sound record is

printed. Both sound records are adjacent to the perforations. The positive is then developed and dried in standard developing machines, and when ready to leave the laboratory is slit into halves, each half accompanying its respective reel of pictures. The halves are wound on reels which are wider than the present ones, having in them separating metal disks, on one side of which are wound the picture films, with the accompanying sound track films on the other side.

In this case everything is standard—picture cameras, recording cameras, reproducing machines, and the projection machine—with the exception of the following minor changes: the upper and lower magazines, the two feed sprockets and rollers, and a shift-base for the sound reproducing unit are replaced, in order to accommodate both sound-on-film and sound-on-separate-film. The same projection machine can be used for projecting silent films or sound-on-disk films. While discussing this process with producers and engineers I gained considerable knowledge of the different viewpoints on projecting sound track on separate film. All are agreed that by projecting the sound track separately better reproduction is obtained. Some prefer a wider sound track; others prefer recording at greater speed. Others have doubts as to whether the two films can be kept in synchronism or how the two films can be wound at the same time. As to synchronizing, the starting point will be marked on both films in the same way as it is marked on the sound film of today. Each reel of sound film that leaves the laboratory has its footage numbers printed on the edge of the film. In case of a break in one of the films all that the operator has to do is to note the edge number of the picture film that is on the aperture plate; the corresponding

number on the sound film is then placed under the sound producing aperture. In case the film is damaged and a few frames have to be cut out, the corresponding frames of the sound records can be cut out; or, better still, the sound track may be left intact, the missing frames being replaced with black frames as is done now with sound-on-disk films. In case of censorship elimination; the exact amount of sound film is taken out with the picture film, avoiding the jump that is noticed where the sound track is printed on the same film. If, in the present method we wish to use the base tints, we have to match and splice positive stock for the exact length of each color before printing—an impracticable procedure. If this process is adopted beautiful base colors and tones can be utilized in the same way as was done in the silent pictures.

Another feature that Mr. Crabtree pointed out is that of recording sound at greater speed. I advocate a speed of 75 feet per minute for photographing and projecting pictures, with a speed of 112½ or even 150 feet per minute for sound track recording, rather than reducing by optical printing to the projecting length of the picture.

#### Color Toning

Mr. Teitel: Referring to the matter of coloring film or tinting intermittent sections of film without coloring the sound track, I would like to say that I have designed a machine in which coloring members come in contact with the film, instead of the film coming in contact with the coloring matter, so that one scene may be black and white, one toned, one tinted, another toned and tinted, and another in full color, all in one continuous operation, without touching the sound track. The coloring member comes

## *Fake Subscription Solicitors*

**RENEWED** activity by certain canvassers who represent themselves to be subscription agents for **MOTION PICTURE PROJECTIONIST** necessitates repetition of past warnings in connection with this matter. **MOTION PICTURE PROJECTIONIST** has no subscription representatives, and anyone representing himself as an authorized agent is an imposter. Subscriptions may be placed only through your Local Union office (usually the Secretary), or direct to the office of publication at 45 West 45th St., New York City. Subsequent to the appearance of this notice, **MOTION PICTURE PROJECTIONIST** will not be responsible for any subscription taken by any agent outside of your Local Union. The attention of your Local Union Secretary should be directed to this notice.

**MOTION PICTURE PROJECTIONIST**



in contact with the film so that it is not necessary to kill colors by having the entire reel colored, and so the necessity of cutting and re-splicing various sections for colors is avoided. I hope this machine will be ready for demonstration at our Spring meeting.

Mr. Otis: Multicolor has co-operated with Electrical Research Products, Inc., in a series of experiments on the effect of toning the sound track red or blue.

Using the potassium photo-electric cell, the red track could not be made to produce as good quality as the blue track; but the blue track gave quite satisfactory results. When E. R. P. I. releases their new caesium cell it will be possible to not only duplicate, with Multicolor blue, the quality of the black and white sound track, but also to secure a track producing, by two fader steps, a greater volume than the present black and white track.

President Crabtree: I think Mr. Jones gave the effect of tinting the film with different dyes on the output of a potassium cell at one of our recent meetings. Further work could be done on the effect of different tones—dye tones and organic tones on film.

Mr. Ross: It seems to us that there are so many advantages in recording sound on separate film for exhibition that eventually the industry will be forced to it. We call attention that, to properly produce the sound effects in *Hell's Angels*, a separate film having two sound tracks is employed. Dramatic critics at S. M. P. E. meetings have forcibly pointed out the necessity for producing realistic "off-stage" effects which now are produced directly rearward of the screen. These realistic "off-stage" effects can be accomplished by employing separate sound film having a plurality of sound tracks, each related to a group of loudspeakers located at points from which the sounds are to be produced and which may be at remote portions of the stage or auditorium. Another example:—When recording a plurality of sources of sound, as, for example, a singer's voice and musical accompaniment, distortion occurs in recording due to the superimposing of the two sound waves, so that faithfulness in reproduction during exhibition is lacking. It is therefore advisable to record the singer's voice onto one track and the accompaniment onto another track. Another example:—Musical accompaniment often attends dialog for emotional effects. When the musical selections are super-imposed on the dialog sound track in printing, as is the general rule in dubbing, the dialog suffers in faithfulness and again it is advisable to record the dialog and musical selections on separate sound tracks.

Any sound that one might wish to produce from points other than the immediate foreground depicted on the screen may be handled in this manner. Loudspeakers may be placed at

remote portions of the stage or auditorium. There are decided advantages for this arrangement which are quite evident to anyone who has tried it.

As an example: Some one might be singing in a distant garden, in which case a loudspeaker at the rear of the stage (perhaps off to one side) would produce the desired "off-stage" effect. It would not be difficult to change over present standard 35 mm. projectors to handle separate sound films. The present single-reel upper and lower magazines can either be converted or replaced by new two-reel upper and lower compartments. The sound head could be supported between these compartments. The projectors, so altered, would not take up any more room than the present sound equipped projectors.

President Crabtree: It is my understanding that stirring music is felt throughout the body, not merely in the ear, so that loudspeakers located in the vicinity of the audience might produce such emotional effects.

There is also the matter of binaural effects. According to experts it is practically impossible to obtain a binaural effect by the present method of sound reproduction, but multiple sound sources appear to solve the problem. I understand that the Bell Laboratories have made experiments along this line.

Mr. Taylor: There are many interesting possibilities in multiple sound tracks, but that is apart from the questions brought up for discussion. Do you want them on the same film or on separate films? These questions are somewhat unrelated. If we can handle film 70 mm. wide and do not need to use the whole of it for the picture, there will be ample space for several sound tracks. One early advantage of the separate film was that existing 35 mm. film, utilizing the total available space for the picture, could be run as a sound picture, with the sound on a separate film, as in the spectacular picture *Wings*. As a matter of economy and convenience it seems highly desirable to continue with sound and picture on the same film as long as possible.

#### Theatre Projection Requirements

President Crabtree: There are serious objections to widening the film. There are the difficulties of handling a film as wide as 70 or 80 or 100 mm.; it takes a Samson to handle it. There is also the matter of submitting the film to heat and scratching. We must get away from that to get the ultimate in sound reproduction.

Mr. Edwards: There is absolutely no handicap with a separate sound track from the production standpoint, but there is a serious objection to it in the theater today. We must not lose sight of the fact that the theaters are already built, and the space in the projection department in more than 80 per cent of the theaters is very limited. The introduction of

separate sound tracks, while quite feasible in some cases, would not be so in 80 per cent of those today. Furthermore, it must be remembered that where there are two machines to be run in synchronism the different starting speeds of two practically similar mechanisms have to be considered.

President Crabtree: I agree with Mr. Edwards. The thing to do is to enlarge the projection room. The exhibitor spends money on billboards in front of the theater; why not spend money to give the projectionists more room? The industry from now on must spend more money on the equipment required to put the show on the screen. We, as a society, should be looking ahead, so that whatever we adopt now will anticipate future requirements. That is the purpose of this discussion.

It would be an economic waste for the industry to adopt a wide film with sound on the same film if within six months it is shown to be better to have the sound on separate film. It is only by getting everyone's opinion that we can outline the best thing to do. In my opinion it is a very important problem.

Mr. James: Is it a fact that we are bound to place sound on film or wax? Isn't there some other material more permanent? We are living in a progressive age and there should be some other method of producing sound.

President Crabtree: That is a fair question. There has been nothing better found to date, or I am sure it would have been adopted.

Mr. Stern: It was my good fortune to canvass the producers and discuss the matter of putting sound track on separate film. One of the reasons that the industry is being forced to adopt a larger film is that by putting the sound track on the same film with the picture and cutting the top and bottom of the picture in the camera, the lost space represents approximately 20 per cent of the original area. The result is that everything in the picture is smaller in proportion. Furthermore, most of the theaters are employing larger screens than they used in the silent picture days, whence the small picture area is enlarged so much more on the larger screen that the graininess becomes objectionable. If the whole field is utilized for the picture alone, putting the sound track on a separate film, there will be no necessity for a wide film.

One thing I failed to mention previously is that, in my plan of projecting sound on separate film, the picture runs intermittently, while the sound track runs continuously. Replying to Mr. Edwards, in the newer theaters two projection heads are usually employed for pictures with sound track on separate film—one for the picture and one for the sound

(Continued on page 45)



# Some Aspects of Stereoscopic Projection

By JOHN BELLAMY TAYLOR†

*Complementing the earlier interesting papers of Hugo Lateltin and Samuel Wein, particularly the former, which have appeared in this publication is the accompanying article by John Bellamy Taylor which was presented at the last S.M.P.E. meeting. Within the past twenty-five years many capable workers have attempted to solve the problem of three-dimensional motion pictures, and their efforts, while not wholly successful, did lay the groundwork for recent and current progress in the art. Inevitably a larger portion of current work in this field is being directed toward a solution of the physiological and psychological implications of the problem, and this trend augurs well for much progress in the near future.*

THE aspect or "picture" of a scene or group of articles depends on the point of view. Two individuals cannot at the same moment occupy precisely the same position; therefore they see things differently. In a smaller degree, but just as truly, distinctly different pictures will be viewed by the left and right eyes of each individual observer. These two "L" and "R" pictures may have differences which are slight, or even insignificant, when viewing flat or distant objects. In general, however, nearer objects will hide from view objects which are more distant, although what is hidden from the left eye may be seen by the right eye, and *vice versa*. Thus we are able to see completely around a small object and partially around a larger obstruction. To illustrate simply, hold up a pencil at arm's length. With both eyes open, the pencil hides nothing, but if the left eye is closed, the pencil covers and hides certain features behind it, while right eye closure obliterates other features.

If a camera is to make a picture record of what is seen, should the lens take the position of either eye and perhaps fail to show something which is visible to the other eye? Or, should the camera lens take a third position which will provide a picture with some other part of the background hidden by foreground objects? We are led to consider two cameras, one to simulate each eye. Or, more conveniently and practically, we may employ a special camera with two lenses making negative pictures, different but coordinated, affording positives or prints which we call a stereoscopic pair.

If we look at the pair of pictures

in such manner that the left eye sees only the picture taken through the left lens, while the right eye at the same time sees only the other picture, the combination of the two views gives the same impressions—physiological and psychological—as were received when viewing the original scene. In the composite or stereoscopic impression, the foreground is distinctly separated from the background; upon closing either eye portions of the background will be lost to view.

From extreme youth we have become accustomed to seeing different overlapping pictures. Instead of being annoyed by double images not in exact register, we sense, from the lack of register, solidity and form, nearness and farness. Continual shifting of alignment of the eyes unconsciously brings into register that portion of the two views toward which attention is principally directed.

The question arises as to why each eye cannot select its proper picture from a printed pair without having to use viewing machines. This can be done over a limited range of picture size and distance, but it involves long training in muscular control in order to bring about a combination of directing and focusing which is unnatural. The mirrors, prisms, or lenses in a well designed and adjusted stereoscopic outfit present the two views to the "L" and "R" eyes independently, without eye-strain.

## Stereoscopic Effect Is Real

The stereoscopic effect is real; it is not one of suggestion or imagination. If we view in the ordinary manner, a stereoautochrome, taken in the woods, we see merely a jumble of trees, twigs, leaves, and grass. When viewed in the stereoscope the two pictures not only clear up into what is large and small, near and far, but certain elements (quite indistinguishable from similarly colored background in a single view) leap into prominence when each eye, independently of the other, views its respective picture.

Since the usual stereoscope allows but one person at a time to view the picture, why could not a pair of pictures be projected onto a screen, to be viewed by a group or a large audience? This can be done, and has been done on occasion. The fundamental requirement for the individual stereoscope must be preserved, *viz.*, the "L" and "R" eye of each observer must see the "L" and "R" picture, respectively; the "L" eye must be prevented from seeing the "R" picture, and the "L" picture must be hidden

from the right eye. Several methods are recognized for consideration:

(1) Project the "L" and "R" pair to show side by side, and view them by trained muscular accommodation. Even with specially acquired ability, the angular limits would greatly restrict the choice of position or number of seats in the theatre. This arrangement, while perhaps the simplest, is considered undesirable for obvious reasons, and is adjudged to be without commercial value.

(2) Project the "L" and "R" pair to show separately; provide each observer with a viewing device of mirrors, lenses, prisms, *etc.*, to direct and restrict each eye to its proper picture. Near and distant observers would require a variety of optical equipment. Those toward the side of the house, or otherwise situated asymmetrically in relation to the "L" and "R" pictures, would require individual optical compensating means for one or the other eye.

(3) Modification of the parallax stereogram of Dr. Ives. In the parallax stereogram, the "L" and "R" pair appear to be superposed, but are, in reality, intermeshed in a series of alternate lines, and are seen through a properly spaced grating which uncovers the lines of the "L" picture to the "L" eye. The eyes must be at a predetermined distance from the grating and picture. This greatly restricts the possible audience.

## Color Separation

(4) Color separation. Project the "L" and "R" pair in different overlapping colors onto the screen. Each observer looks through spectacles or lorgnettes of colored glass or dyed film, *e. g.*, green before the left eye and a complementary red before the right. The complementary colors, separately received, give a fairly satisfactory psychological white and grey monochrome, *i. e.*, the method is not adapted for color effects. There may be undesired color effects from unbalanced or irregular vision. A question has been raised concerning the possible eye-strain from a long continued use of a different color for each eye. Because of the cheapness of the viewing screens, this is believed to be the only stereoscopic projection system so far shown to the largest audiences. It has been regarded as a novelty rather than of permanent commercial value.

(5) Separation by polarization. The "L" and "R" pictures may be projected, overlapping each other, by polarized light (through Nicol prisms or other devices), the one picture being polarized in a plane rotated 90° (Continued on second page following)

† Research Lab., General Electric Co., Schenectady, N. Y.



# As *The* EDITOR Sees IT

## I ¶ *Gods—Tin and Otherwise*

IN an industry which is more productive of heroes and heroines in line for worship than any other it is refreshing to have a personality like William F. Canavan, President of the International Alliance. While concerned primarily with the status of the laboring man within the industry, President Canavan has, we believe, a broader outlook and a better understanding of the industry's problems in all branches—including production—than any executive in the business. When Mr. Canavan speaks on motion picture matters he is assured of an attentive audience, and this expectancy is rarely disappointed. A case in point are his remarks before the recent annual meeting of the Projection Advisory Council. In commenting on the higher status gained by technical workers in the field within the past few years, President Canavan said:

"We hear much talk these days about the importance of the various branches of the industry. The star system lends itself naturally to the canonization at regular intervals of a new crop of saints; while the writers and directors come by their sense of importance in direct proportion to the extent to which they are ballyhooed. Lately we have heard from other workers in the art:—the sound technician, the cinematographer, the studio mechanic, and the projectionist. While it is gratifying to learn that self-esteem is so evenly distributed among motion picture workers, it appears to me that one very important (should I say indispensable?)—one very important personage in the whole scheme of things motion picture has been overlooked. And this personage is all-important—he who walks up to the box-office and lays down his money for admission, the paying patron.

"Credit should be given to a job well done, irrespective of by what branch; but it seems to me that a closer coordination between the various branches and a more general understanding and appreciation of the needs of the paying patron, the one and only motion picture god, is eminently desirable at all times and particularly so at the present time."

Any remarks?

## A ¶ *All-A. C. Sound Reproducers*

COMPLETELY A.C.-operated equipment has long been the goal of sound picture reproducer technicians, and it is pleasant to be able to record that such an equipment is now available. RCA Photophone, Inc., which is responsible for this development, has made many forward strides during the past year, but none is more important than their work with this new all-A.C.-operated equipment. This equipment will serve not only to insure a smoother and better performance but will also tend to decrease sharply the original and subsequent costs to the theatre and will lighten the burden of the projectionist to an extent where he will be free to devote more time to other important duties.

This is all very cheering news, particularly since it implies that the exhibition end of the business will continue to keep pace with the advances made in the studios. It is just two years ago that we first made a plea for all-A.C. equipment, and the satisfaction derived from this accomplishment is tinged with regret that the job could not have been done sooner. A few other pressing problems remain—proper volume control, an improved sound screen, combination prints, and, lo and behold, film mutilation, to mention only a few. The last named is most important of all.

## C ¶ *Advisory Council's Second Birthday*

CONGRATULATIONS are in order for the Projection Advisory Council on its second birthday which was marked by the recent annual meeting held in New York. A review of the work done by this organization in the few months it has been in existence would reflect credit on an organization many times its size and with ample financial resources. But when it is considered that the Council has not received the wholehearted support of all projectionists, and has had but a few men who would actually take off their coats and go to work for it, its accomplishments are little short of astonishing. Its publicity work alone is invaluable, but it has a record of work accomplished which has been productive of more tangible results.

Here certainly is an organization which is worthy of the support of every projectionist. That work which is now being done by a few loyal workers could be increased tremendously in value with just a bit more assistance. Moral support for a project of this sort is all very well, but the organization requires financial support, too. Surely it would not be asking a great deal to solicit some slight degree of financial support from every Local Union. The Local need not outdo itself by having its roster of members made life members of the Council, but it might reasonably make a flat yearly payment for all its members. And this brings us to another consideration

It might well be asked just why Local Unions should render assistance to the launching of reforms the net result of which is to save money for producers and exhibitors. While it is true that the Council has lent itself to various plans for effecting economies for these branches, it should be remembered that the Council is primarily a projectionist organization and that all its activity is predicated on this basis. The projectionist comes first, and anything which contributes even in slight degree to the advancement of his interests will have the support of the Council.

The Projection Advisory Council merits and should have the support of every projectionist in this country and in Canada.



## Some Aspects of Stereoscopic Projection

(Continued from page 19)

degrees from the other. Analyzing devices, properly adjusted to match the polarizing planes of the projected pictures, exclude the "L" picture from the right eye and *vice versa*. Since the polarization is largely broken up after reflection from the usual diffusing screen, the method requires a metallic screen, or one giving specular reflection. This system may be characterized as of scientific rather than practical interest.

(6) Separation by alternate "L" and "R" projection and viewing. This idea is quite old. The validity of the method of blinking the eyes synchronously with the projected pictures was demonstrated by shifting peep holes in extensions on the side of a double projecting lantern having a rotating shutter before the lenses. The two views appear on the screen to be superposed, but one is cut off before the other appears. Persistence of vision was thus relied on to give a continuous impression in a projected picture years before the film motion pictures were developed. One of the early writers suggested electrical blinkers in front of the eyes, worked from contacts on the projector shutter mechanism.

More than twenty years ago, the writer constructed and demonstrated privately a stereo-projection system in which the 60-cycle house lighting service was used to maintain synchronism between the alternate "L" and "R" screen pictures and a portable electric lorgnette. This shutter device, on a cord long enough to permit viewing (while observing the picture as seen in relief on the screen) was used at various distances and angles.

Actually, a side view of a screen gives no more distortion for a true stereoscopic picture in relief than it does for a single flat picture. However, while moving about, some of the effects obtained were quite unexpected. The autochrome process came onto the market at about the time of the stereo-projection development cited, and afforded means for showing stereo pictures in color by projection on the screen.

### The Public's Reaction

In spite of the realistic and striking effects possible, it has always seemed questionable as to how the public would react toward stereoscopic motion pictures requiring a special viewing device for each observer. This question can be best answered only by trial, although this involves special development all along the line, *viz.*, cameras, printers, projectors, and viewers.

Can a stereoscopic effect be obtained without two pictures and a separating device? In the opinion of

the writer, the only proper answer is, "No." The illusion of reality in a picture may rest upon many things, none of which may properly be called stereoscopic. For example, perspective, relative size, shadows, color, progressive haziness, motion, *etc.*, all aid in estimating distance in a single picture. But none of these meet the true stereoscopic test, which is seeing with one eye something which is hidden from the other.

### DISCUSSION

MR. PALMER: I have heard statements made that when viewing stereoscopic pictures in which the pictures are separated optically, there are certain people who are color blind with respect to viewing the picture in this way. I wonder if in Mr. Taylor's investigation of the subject he has found this to be the case. Again, is the stereoscopic effect enhanced by viewing the picture from the focal point; that is, the point where the negative image was at the time the picture was made?

MR. TAYLOR: I have never found that anyone having two normal eyes would have difficulty in seeing the picture in the box form if the lenses were focused.

As to viewing angle, if we should want to make a stereoscopic picture and see it as it appears in nature, the proper relation between the focal length of the taking lenses and the distance from which the finished stereogram is viewed, must be maintained. I have taken a picture out-of-doors and mounted it; then, looking at the view with one eye and at the picture with the other eye, it was possible to have the picture register almost exactly with the scene itself. Sometimes it is desirable to exaggerate the stereoscopic effect. The eyes of a man are a certain distance apart. The eyes of a cow or horse are farther apart. If we should want to see as an animal sees, we should have to adjust this distance to suit. This procedure is followed by astronomers where they make a separation of 186,000,000 miles, taking the picture first from one side of the ecliptic, and six months later from the other side. On very distant objects the two lenses may be separated by a yard or two. This gives a relief effect with mountains which is exaggerated, but which may be desirable in stereoscopic surveys.

### "Favoring" One Eye

MR. EDWARDS: Don't you think the reason why some people cannot see stereoscopically is that they get into the habit of favoring one eye, and they really use only one eye. Sometimes, with a single, flat picture taken with a single lens we can obtain a stereoscopic effect. Why can we not obtain that effect in a motion picture? We know that the illusion can be created by having a stationary foreground and a moving background.

MR. TAYLOR: Some people look into a microscope and do not see any-

thing because they do not know what points to focus on. That is to some extent a matter of training. This can be overcome with a little training. As to the statement that single pictures show the stereoscopic effect, I have never seen them, although many factors in motion pictures contribute to the illusion of reality. Sometimes one may think that nothing is lacking and say the effect is stereoscopic, but this seems a misuse of the term.

MR. MORRALL: Some time ago I took some pictures of a room in which a man was working with material which covered him with dust. The lighting was the same as they used in a preceding scene, where the dust was not present. When projected, I was amazed to see a stereoscopic effect in the picture. This might be attributed to the fact that the coating of dust reflected light in such a way that it caused the stereoscopic effect.

### "Back-Lighting" Process

MR. ROSS: I agree with Mr. Edwards that in motion pictures we frequently do find stereoscopic effects. The effect is produced on the West Coast by what is known as "back-lighting." Experiments show that back-lighting produces this illusion whereas without back-lighting the illusion is not present.

MR. TAYLOR: I have already stated that many things, such as light and shade, relative size, and motion help to estimate distance, but it will be unfortunate if we confuse the two ideas.

### Effect of Eye-Strain

MR. FRITTS: On viewing a normal scene, the eyes are focused at a definite point and the rest of our vision is strained, in the sense that the eye is trying to accommodate its vision to all visible planes. It has been suggested that this may have something to do with the appreciation of depth. In certain experiments which we have made, a picture having a marked foreground and distance was viewed through a large uncorrected lens. The eye, under those conditions, is subject to eye-strain on the borders, which is akin to the eye-strain of normal vision, giving the effect of depth. Is this correct?

MR. TAYLOR: Without the actual set-up, I can only conjecture. This may be a case of factors other than stereoscopic, which aid in judging distance.

MR. PHELPS: When looking at a contact paper print and then at a lantern slide of the same negative, projected on a well-illuminated screen, my eye seems to tell me that there is more depth in the projected image than in the paper print.

MR. TAYLOR: Perhaps because the lantern slide more closely approximates the proper light and dark ratios. In real life, we have a large ratio, and in a good slide we can more closely approximate this. No print has natural ratios. In the case of transparencies we come nearer to the proper values.

### W. E. Nears 5,000 Mark

Western Electric sound system installations in the United States now total 4,902.



# New RCA All-A.C. Sound Reproducer

**F**OLLOWING months of research and experimentation, RCA Photophone, Inc., has produced

what is claimed to be the first satisfactory all-A.C. operated sound motion pictures reproducing equipment. Styled "Standard Size Theatre Equipment," the new apparatus was designed for theatres of 1,000 seating capacity and under, for sound-on-film projection, and is priced at \$2,500.00. No batteries or motor generators are required to operate this machine. Power supplied from 110 volt, 50-60 cycle A-C. to amplifier is all that is necessary. Constructed to take advantage of recent refinements in recording, this and simplicity in operation and installation are its most important characteristics. Compactness permits installation without extensive projection room alterations.

The amplifier of this "Standard Size" equipment is comparable to the latest type of A-C. operated radio set. No longer is it necessary to employ wet cell storage batteries which require constant care and re-charging and even replacement after several years of continuous service. With most battery-operated theatre reproducing equipments it has been necessary to supply even a spare set of storage batteries. With this amplifier the use of dry cell "B" and "C" batteries is no longer necessary, saving considerable replacement expense. All that is necessary is to plug the amplifier in the A-C. supply the same way as is done with the new type radio set and it is ready for operation.

This equipment has been designed primarily for sound-on-film reproduction but can be supplied for sound-on-disc reproduction as well.

## Components of Equipment

This equipment consists of:—2 sound heads for either Simplex or Powers projectors, 2 projection driving motors and accessories, 1 all A-C. operated reproducing amplifier, 1 stage loudspeaker with directional baffle, and 1 monitor loudspeaker.

The 5-ampere exciter lamp is mounted in a removable bracket so constructed that it may be replaced rapidly and easily. A pre-focused lamp in a spare bracket is kept conveniently available. The optical system has been carefully designed and manufactured with microscopic precision. Although sturdily mounted and adequately protected, it may easily be cleaned. An outstanding feature of this system is that the exciter lamp does not have to be accurately focused with respect to the optical system. The filament of the lamp does not have to be too accurately focused and wrinkles in the glass of the lamp will not affect operation. All that is re-

quired is that sufficient light be projected through the optical system on the slit.

RCA Photophone reproducing equipment utilizes the method of focusing the image of the slit in the optical system on the sound track, whereas some other equipments focus an image of the lamp filament on the sound track. In the latter case great accuracy is required in the construction and position of the exciter lamp.

The sound gate has a curved aperture which is hardened, ground and highly polished. Its adjustable tension shoes are of spring steel so devised that constant and uniform pressure is applied to the film along the entire length of the gate which not only reduces wear on the film but prevents the collection of emulsion.

## The Sound Gate

The sound gate guide rollers are of ample size and are easily adjusted. The sound gate at its lower extremity is equipped with an idler roller under which the film is drawn as it leaves the gate, reducing friction at this point to a minimum. Placed slightly below and to the left of the gate is a special roller which has a dynamically balanced flywheel mounted on the opposite end of its shaft. This assembly is not coupled mechanically to any part of the sound head and revolves independently in ball bearings. (The roller just described is called an "impedance roller," because its function in the soundhead may be compared to the effect of an inductance in an electrical circuit.)

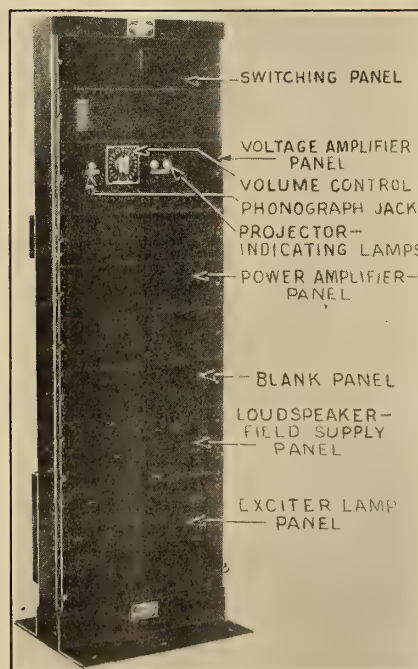
The film after passing through the sound gate is looped around this impedance roller and is then threaded around the "sound sprocket" which is of special design. A loop is left between the sound sprocket and the following "hold-back" sprocket, the purpose of which is to prevent a poor reel or defective take-up mechanism from jerking the film on the sound sprocket and causing flutter. The film is then fed into the lower magazine. The function of the impedance roller and flywheel assembly is to prevent variations in the speed of the film as it passes through the sound gate.

When the projector is "started up," the film looped around the impedance roller acts as an ordinary belt and drives the roller as such. Should the film tend to slow down during operation, the roller assembly will instantly take up the load, because of its inertia, and drive the film of itself, in lieu of the sound sprocket, until the speed of the film increases at which point the film again acts as a belt and drives the roller. A tendency to speed-up will also be opposed by the roller assembly. Because of this simple and effective means of lending inertia to the thin ribbon of film, the reproduction obtained is free from flutter or other distortion common to some other types of soundheads. Mechanically, the soundhead is well constructed and is machined with precision.

A condensing lens mounted directly in front of the sound gate collects the light from the scanning beam as it passes through the gate and projects it into the photo-cell. A photo-cell housing is attached to the front of the soundhead and contains a standard UX socket for photo-cell mounting, a rheostat and ammeter for exciter lamp current control, the shielded photo-cell transformer, and a terminal strip for inter-apparatus connections. An opening in the top of the housing is provided with a removable cover to permit access to the photo-cells. The powerful and long-lived RCA UX-868 caesium photo-cell, together with its associated transformer, make the use of a soundhead amplifier unnecessary, thus eliminating a source of trouble.

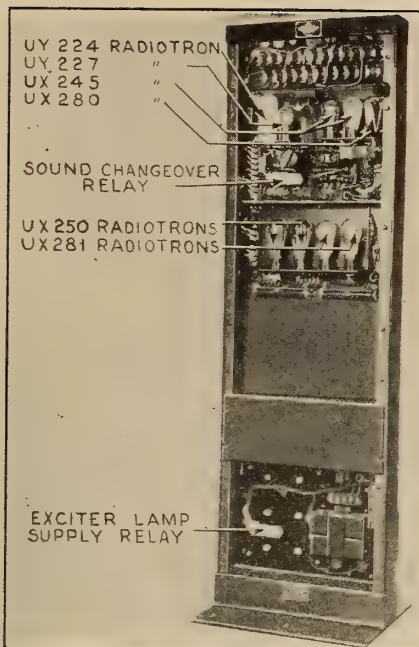
The improved photo-cell transformer has a low impedance balanced secondary and works directly into the voltage amplifier, which may be located at any distance up to about 100 feet from the soundhead. This method of connection is free from external pickup and has been so designed that it is unnecessary to use a photo-cell amplifier to step-up the signal at the sound head. In this way the equipment uses only one amplifier, so that all the tubes are located in one place, simplifying operation.

The type of motor supplied depends,



Front view of new RCA amplifier





Interior view of amplifier of new RCA equipment

of course, upon the available power supply in each particular case. The D-C. motors are of the speed regulated type; A-C. motors are of the constant speed type, and neither require the use of complicated speed control devices. Suitable brackets for mounting motors are supplied.

#### Sound Change-over

For sound change-over or switching sound from projector to projector a relay is used which is controlled by a switch mounted conveniently at each projector. The relay transfers the amplifier input to the proper projector. A particularly novel feature of this device is that the sound change-over automatically turns on the exciter lamp of the particular projector to which the amplifier input has been transferred. This prevents the possibility of losing sound as a result of neglecting to turn on the exciter lamp.

It also doubles the life of the exciter lamp since it is only lighted when actually being used. The switch used to control the change-over has an "OFF" position which can be used when it is desirable to eliminate certain parts of the sound picture due to censorship.

The amplifier is designed for complete operation on 105-125 Volts, 50-60 cycles A-C. Its use on other types of power supply will necessitate the addition of converting equipment.

The amplifier is of the unit panel type, each unit being assembled on separate panels and mounted one above the other in a strong pressed steel, rigidly supported, welded channel rack. The front panels, being merely cover panels, are readily removable for inspection and service and each individual unit panel may also easily be removed from the rack. This feature, beside the advantages of accessibility and interchangeability,

permits the rack to be installed close to a booth wall. It is designed to stand on the floor so that no trouble need be encountered in connection with mounting the rack. The overall dimensions of the amplifier rack are 63 $\frac{1}{2}$  inches high, 20 inches wide, and 11 inches deep. The panels are arranged from top to bottom in the following order:

- 1—Switching panel
- 2—Voltage Amplifier panel
- 3—Power Amplifier panel
- 4—Blank panel
- 5—Loudspeaker Field supply panel
- 6—Exciter Lamp supply panel

The front panels of the voltage and power amplifier panels are constructed of two sections each, the lower section being solid while the upper is perforated to permit observation of the tubes. The perforated sections are quickly removable for the purpose of changing tubes. All live terminals in these panels are covered to prevent the projectionist from coming in contact with them. With this arrangement it is perfectly safe for the projectionist or service man to make a replacement while the equipment is in use. All of the rack interconnections are cabled. The signal leads are run on one side of the rack and A-C. and rectified A-C. leads on the other. All audio input leads are well shielded, the shielding being grounded. Each panel is completely self-contained and equipped with its own power supply unit.

The switching panel contains one flush-type tumbler switch which controls the entire power supply to the various panels. To energize the equipment it is merely necessary to throw this single control. With this amplifier it is not necessary to adjust any voltages through the use of rheostats, such as is used on battery-operated or motor-generator-operated amplifiers.

#### Voltage Amplifier Panel

The necessary transformers, resistor, condensers, tube sockets, etc., as well as a complete power supply unit are contained in this panel. All of the units are mounted on a steel

base panel. The inter-stage, output and power transformers are mounted in individual metal housings. The input transformer is mounted on the back of the panel in a heavy steel shield. There are several more shields surrounding this transformer so that it is as completely shielded as possible. Tube sockets are mounted vertically on pressed steel sub panels.

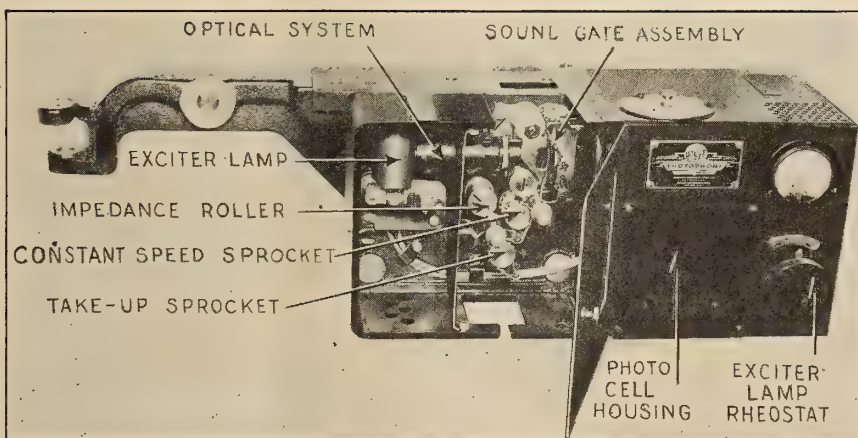
The voltage amplifier employs four Radiotrons in three stages, the first stage of which is transformer-coupled to the photo-cell transformer, uses a UY 224, which is in turn resistance-coupled to the second stage in which a UY 227 is coupled by an inter-stage transformer to the last stage of 2—UX 245's in push-pull. A sheet steel cylinder shields the UY 224. A potentiometer connected in the grid circuit of the UY 227 is used as the gain or volume control. All of the tubes in the voltage amplifier are self biased. A "special input" jack is included for the use of a non-synchronous turntable unit.

The power supply mounted on and furnishing power for the voltage amplifier consists of a power transformer, one UX 280 rectifier tube, and a 3-stage filter. A resistor across the power supply furnishes the photo-cell polarizing potential. Pilot lamp as well as tube filaments are supplied by the power transformer. A 110-120-volt switch is provided for changing the tap on the primary of the power transformer for supply voltages of 105-115 or 115-125 volts. The fader relay for sound change-overs is mounted in this panel.

#### Power Amplifier Panel

All transformers, reactors and capacitor pack are mounted in individual metal containers on the back of this panel. The power stage consists of 2 UX 250 tubes in push-pull. Two UX 281 rectifier tubes connected for full wave rectification through a suitable filter furnish plate potential. The UX 250's are self biased. All filaments are supplied by the transformer. A 110-120 volt switch is provided for supply voltage regulation.

A power transformer, rectox unit



Soundhead of the new all-A.C. operated RCA Photophone standard size reproducer



with filter capacitors and a 110-120 volt switch comprise the loudspeaker field supply panel. This unit will supply the fields of one monitor and two stage loudspeakers and power for the fader relay coil. The back of this panel has for its cover a perforated iron sheet.

The unit which furnishes power for the exciter lamps is made up of a power transformer, rectox unit, reactor and a large capacitor of the dry electrolytic type. The reactor and capacitor forms an effective filter which prevents the possibility of hum being set up in the loudspeakers due to the A-C. exciter lamp supply. A relay in this panel operates in unison with the fader relay and automatically connects the exciter lamp of the projector in use to the power supply. A 110-120 Volt switch is included to provide for line voltage regulation.

#### Speaker Equipment

The monitor speaker consists of an 8" dynamic cone unit mounted on a flat metal baffle 15 inches square. A volume control is mounted on the

baffle. The stage loudspeaker furnished with this reproducing equipment is a 6-inch dynamic cone unit equipped with a directional baffle. This speaker has recently been developed by RCA Photophone and is considered to be the finest loudspeaker, commercially available, in the world. The range of frequencies which it reproduces is much wider than that of other speakers. Its response is much more uniform as well. It possesses directional properties particularly suited to theatre work and is very sturdily built. This speaker will stand up indefinitely under hard and continuous usage without rattling or breaking down. It has a high efficiency. Its use with the "Standard Size" reproducing equipment accounts in great measure for the unusually excellent results obtained.

The directional baffle furnished with this equipment is the newest type 37" baffle especially designed for use in small theatres where the available space behind the picture sheet is limited.



Figure 3

employed to any great extent in projection, except to alter the focal length of a single convex lens or plus combination, prisms are combined with their bases toward the edge, which makes a concave lens thin in the center and thick at the edge, as against a thickness in the center and thinness at the edge in a convex lens. (Figure 3 for concave lens.)

On the basis of their construction as series of prisms, any spheric lens of an established power can be readily decentered so as to create a prism of definite value. The rule to be applied is that

$$D = \frac{10 \times P}{\text{Lens}}$$

If a projectionist has a +5 lens and wants to create a two-degree prism with that lens, all he need do to determine how much he must decenter the lens is to apply the above rule and substitute known values for symbols. In this instance, the D, or decentration, is unknown, but the P, or prism, is given as 2, and the lens is 5. Hence,

$$D = \frac{10 \times P}{\text{Lens}}$$

or the amount of decentration, is  $5D = 20$ , or  $D = 4$  mm.

One salient point to be observed in creating prisms, or in calculating the amount of prism that has been created, is the effect which movement in or out will have in displacement. A convex lens moved inward will cause displacement in that direction, and the action of a concave lens will be the opposite.

#### Increased Use of Prisms

With the advent of colored pictures and the wide film in the motion picture industry prisms have taken on a more material significance than has previously been the case. All indications point to a steady increase in the importance and application of the prism in the studio and in the projection room.

Prisms have long been used to obtain "trick" effects, but that they can be given a more stable application is being demonstrated to those in the motion picture industry, and it should not be long before the projectionist will be expected to have at least as general an understanding of prisms as is set forth in this article.

## Prisms in Projection Work

By David Levinson

PRISMS and lenses are intimately associated in the optical system, but a prism is not, in the true sense of the word, a lens. The difference in construction between a lens and a prism lies principally in the fact that a prism is a wedged-shaped portion of a transparent medium that has two plane sides inclined to one another, while a lens, in its application to motion picture projection, is a transparent refracting body that has two surfaces of equal power in all meridians of each of them.

As a result of the variance in construction, the action of a prism and that of a lens is naturally dissimilar. Light rays striking a prism will not be spread from, or converged to, a point, as is the case when they are acted upon by a concave or convex lens. A prism has no converging or diverging power and the light rays that come in contact with a prism are merely bent toward the base of the prism, the displacement being in proportion to the power of the prism and the distance of the light source from the prism.

As a standard for measuring

prisms, a one-degree prism is taken as one which "has the power to bend a

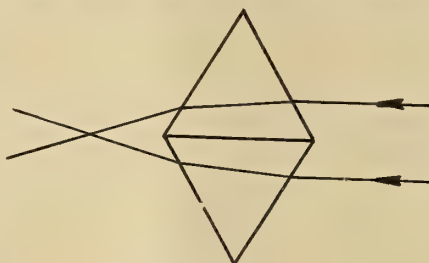


Figure 2

ray of light passing through it and to a distance of one metre (about 40 inches) beyond, exactly one centimeter."

In Figure 1, ABC is the prism, AC being the base. The point B, at which the two sides, or intersecting surfaces, AB and BC meet, is the apex of the prism, and the angle ABC thus formed, is the refracting angle of the prism. An incident ray of light (a ray of light before it reaches the second surface) meeting the prism ABC would not proceed directly through it in a straight path from point W to point X, but it would, rather, be bent toward the base of the prism, and, in effect, appear to come from point Z.

Although prisms are not in themselves lenses, they do merge in series to produce a lens. The convex spheric lens used so extensively in the motion picture projector can be considered as base-to-base prisms turned toward the center of the lens, so that light rays passing through the lens converge at a definite point—the screen. (Figure 2.)

In the concave lens, which is not

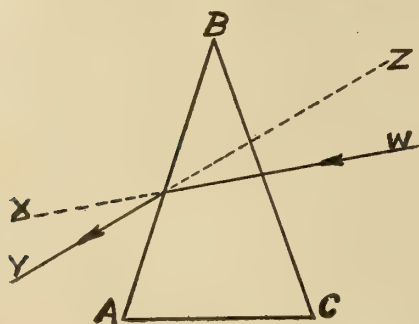


Figure 1



## A Selected Technical Glossary

**S**OUND recording and projection have greatly enlarged the extensive and often picturesque technical vocabulary which grew up with the motion picture industry. During the past two years, scores of highly specialized terms have been taken over or adapted from electrical and radio engineering, acoustics and many other fields.

The new vocabulary has merged with the old, but the correct usage of terms is still far from being universally understood. The need for a compilation of technical words and phrases in their specific application to motion picture usage was brought to the attention of the Academy of M. P. Arts and Sciences during the courses in sound technique which were given for 900 selected studio employees during the past year. It was evident that if studio workers were more familiar with technical terms in their own work and in other departments with which they come in contact, it would be an asset toward increased efficiency.

To meet this need the Technical Bureau of the Academy set about under the supervision of Lester Cowan to prepare a useful glossary for the studio and theatre worker. To this end leading technicians have given generously of their time and knowledge; and liberal use has been made of the glossaries and definitions published by the S.M.P.E., the I.R.E., the A.I.E.E., and other technical glossaries and encyclopedias, to which sources the Academy acknowledges its indebtedness.

The Academy points out that there will inevitably be differences of opinion and recognized practice in the application many terms, and no single authority can be appealed to in every instance. Therefore, users of the glossary are cordially invited to call errors and suggested additions to the attention of the Academy Technical Bureau so that by periodic revision the glossary may be kept authoritative and up-to-date.

The complete Academy glossary will be published in this publication in a number of consecutive issues. The first section is appended hereto.

### A

**"A" BATTERY.** Battery supplying current to heat the filament of a vacuum tube.

**ABERRATION.** In a lens, generally refers to chromatic aberration. May also refer to spherical aberration, a blurring of the focus, due to the spherical shape of the lens faces.

**ABSORPTION, ATMOSPHERIC.** See atmospheric Absorption.

**ABSORPTION COEFFICIENT.** See coefficient.

**A C, GIVE 'EM!** See give 'em A C!

**ACETATE FILM.** Film whose base is composed principally of cellulose acetate.

**ACHROMATIC LENS.** Compound lens so devised ("corrected") as to have no chromatic aberration for two or more wave-lengths (colors), and very little aberration for all other visible wave-lengths.

**ACOUSTICS.** (1) Science of sound, (2)

Acoustics of an enclosure; refers to hearing conditions within the enclosure, due to reflections and absorptions of sound.

**A-C PICK-UP.** Undesirable sound in the recording system—specifically, hum due to induction from neighboring a-c circuits.

**ACTINIC RAYS.** Rays having the property of effecting chemical changes, particularly on photographic emulsions. Generally only the rays to which ordinary emulsions are strongly sensitive are spoken of as actinic; these include green, blue, violet, and ultra-violet. All visible and invisible rays are more or less actinic, however.

**ADDITIVE PROCESS.** Any color process in which various hues are obtained by the addition of two or more of the spectral regions comprising white light. In cinematography, such a process involves both (1) the storing of color values in the film (on successive frames, or separate portions of the same frame, or on different films) by the use of two or more color filters in photography, and (2) the reproduction of colors by the use of color filters again in projection. The film itself is generally not colored at any time; each frame or portion simply contains a black and white record of a certain limited color group. Compare subtractive process.

**AEOLIGHT.** (Aeolight.) Type of glow discharge tube which varies the intensity of its emitted light in accordance with small variations in the electric current flowing through it. (First syllable pronounced to rhyme with "day.")

**AERIAL IMAGE.** See image, aerial.

**A. F.** Abbreviation for audio frequency.

**AIR CONDENSER.** See condenser, air.

**ALL BOTTOM.** Sound in which low frequencies predominate.

**ALL TOP.** Sound in which high frequencies predominate.

**AMPERE-HOUR.** Quantity of electricity equal to that carried by a one-ampere current in one hour. Equals 3,600 coulombs.

**AMPLIFICATION, POWER.** See power amplification.

**AMPLIFIER.** A device for increasing the amplitude of electric current, voltage, and/or power, through the control by the input power of a larger amount of power supplied by a local source to the output circuit. Specifically, (1) a vacuum tube used for this purpose; (2) the whole circuit of which such a tube is the essential element.

**AMPLIFIER, AUDIO-FREQUENCY.** See audio frequency amplifier.

**AMPLIFIER, BRIDGING.** See bridging amplifier.

**AMPLIFIER, CONDENSER TRANSMIT-**

**TER.** See condenser transmitter amplifier.

**AMPLIFIER, GAIN.** See gain amplifier.

**AMPLIFIER, PHOTOELECTRIC-CELL.** See photoelectric-cell amplifier.

**AMPLIFIER, POWER.** See power amplifier.

**AMPLIFIER, PUSH-PULL.** See push-pull amplifier.

**AMPLIFIER, RECORDING.** See recording amplifier.

**AMPLITUDE.** The maximum height, or maximum depth, of a wave, measured from its base line or middle position. One-half the distance through which each part of the medium carrying the wave will vibrate from the time a crest passes to the time the next trough passes. The energy contained in a wave varies as the square of the amplitude of the wave.

**ANCHOR BOLTS** are used to fasten machines to their foundations.

**ANGLE OF INCIDENCE.** Angle between a ray and the normal (perpendicular) to a surface it strikes.

**ANGLE OF REFLECTION.** Angle between a reflected ray and the normal (perpendicular) to the reflecting surface.

**ANGLE OF VIEW.** See view, angle of.

**ANGLE SHOT.** A photographic view taken obliquely. See camera angle.

**ANODE.** Positive terminal of an electric device (cell or tube), at which the current (in the conventional direction) enters the device.

**APERTURE.** Opening in a partition; particularly, (1) the oblong opening at which each individual frame of a motion picture film is situated during exposure, printing, or projecting, as the case may be. (2) See aperture, limiting.

**APERTURE, EFFECTIVE.** Diameter of the imaginary aperture equal to the real diaphragm aperture multiplied by a factor to correct for the reduction in apparent size produced by the front lens. Equals the apparent diameter of the lens viewed from the position of the object against a diffusely illuminated background such as the sky.

**APERTURE, LIMITING** (sometimes simply "aperture"; but see aperture). Whatever opening in an optical system limits the maximum size of the image.

**APERTURE, RELATIVE.** Equals the effective aperture divided by the focal length of the lens. Thus a relative aperture of f:8 means that the focal length is eight times the effective aperture. A measure of the speed of the lens.

**APERTURE PLATE.** Plate of metal, containing the aperture in a projector, printer, or camera.

**APOCHROMATIC LENS.** Achromatic lens corrected for three colors.

(Continued on page 38)

## MOTION PICTURE THEATERS THROUGHOUT THE WORLD 1930

	THOUSANDS OF THEATERS				
	5	10	15	20	25
EUROPE					5401
					28434
UNITED STATES					227312500
LATIN AMERICA	4954	527			
FAR EAST	4283	905			
CANADA	1100	450			
AFRICA	769	110			
NEAR EAST	74				

ITALICS INDICATE SOUND INSTALLATIONS  
ALL THE ABOVE FIGURES ARE APPROXIMATIONS

Courtesy U. S. Dept. of Commerce



---

# ANOTHER

---

## NOW READY!

RCA Photophone, Inc.,  
introduces a completely

## A. C. OPERATED

sound reproducing equipment for  
theatres of 1000 seats or under.

NO BATTERIES!  
NO MOTOR  
GENERATORS!

\$ **2500** CASH

---

# RCA PHOTO

---



# TRIUMPH

## DESIGNED FOR THE SMALL THEATRE

Simplified operation . . . Built for small projection booths . . .  
Installation and maintenance costs reduced . . . New loud  
speaker and directional baffle designed for limited area behind  
screen . . . Latest refinements in recording make possible the  
faithful reproduction of sound range never attained before . . .  
An engineering triumph that places the small theatre on a par  
with the super de luxe house. Rapid and expert service from  
conveniently located service stations. Three year deferred pay-  
ment plan reduces weekly cost of Standard Size Equipment to  
\$34.88, including rental, service, insurance and carrying  
charges. Exhibitors are especially invited to inspect this new  
equipment at No. 411 Fifth Avenue.

**PRICES OF SUPER AND LARGE  
SIZE REPRODUCING UNITS  
HAVE BEEN LOWERED**

... **3 YEARS**  
**TO PAY**  
**IF DESIRED**

**PHONE** INC.



**FULL INFORMATION!  
USE THIS COUPON**

RCA PHOTOPHONE, Inc.,  
411 Fifth Ave., New York City.

Gentlemen: Please send full particulars of the  
Standard Size      Large Size      Super Size

\_\_\_\_\_  
Manager

\_\_\_\_\_  
Theatre



# Color Film System Requirements

By HANS VON FRAUNHOFER

**D**ESPITE endless study and expensive experimentation by practically all the raw film, photographic plate, and paper manufacturers, as well as by scientists in all parts of the world, the art of color photography and color cinematography is still in a primitive state. On both sides of the Atlantic, experts openly admit that the problem of natural color photography and natural color cinematography is still an unsolved one. Although the Patent Offices of almost every civilized country have on file hundreds of patents on processes for color photography, and although many millions of dollars have been spent in the development of this art, a color photograph is obtained only at great cost and with the aid of many complicated and laborious methods. In motion pictures, too, color scenes are the result of costly and complicated mechanical and optical processes.

It is interesting to know that the problem of color photography can be solved in only three ways, namely, the "additive" method (optical); the "subtractive" method (mechanical); and the "auto-chrom" method (chemical).

Most scientists and inventors, during the last quarter century, have followed the optical and mechanical methods, and have, therefore, failed in producing a method of color photography and color cinematography which would justify universal adoption.

## Defects of Additive Method

Past performances have proven the fact that the additive method, although theoretically sound, is not commercially feasible for several reasons. The first and most important reason is the fact that all optical methods have to use contrast filters to obtain color separation. These contrast filters absorb so much light that it is very difficult to obtain proper exposures. Because of this, it is only possible to obtain good negatives on a very bright and sunny day, and even then, only between the hours of 10 A. M. and 3 P. M. In the projection of an additive film, we encounter the same difficulty, namely, the loss of light due to the use of contrast filters. It is admitted that this difficulty can be eliminated, but even if this were done, the "additive" method has two other serious drawbacks that could not be done away with. These are "flicker" and "color-fringes," the latter named "parallaxa" by Professor Miethe.

The "flicker" is due to the fact that the additive method is a method which uses two frames if it is a two-color

process—red and green alternating—or if it is a three-color process, red, green and blue alternating. It is a well-known fact that red is a warm color, whereas green and blue are half-tones and cold colors. In the projection we encounter, therefore, the difficulty of mixing the two or the three colors so as to obtain a flickerless picture.

Scientists who have devoted a great deal of study to the development of color disks and filters frankly admit that it is impossible to devise a disk or scenes which enable a flickerless projection. If the colors used in the screen are too light, the result is a colorless picture on the screen; and if the color are too vivid, the flicker cannot be eliminated. Theoretically, a two-color film should be flickerless at a projecting speed of thirty-six pictures per second. But this is only a theory. The fact is that, at a projection, of even forty pictures per second, a steady and "flickerless" picture is not brought about. It simply cannot be done with less than forty, and the moment the picture is to be projected at forty pictures a second, the process has ceased to be feasible for either amateur or commercial purposes.

## Problem of "Color Fringe"

In addition to the unavoidable flicker, there is the element of color-fringes. The elimination of this is impossible, and for this reason if a moving object, such as a ball, travels in the air, in the first of the alternating frames the ball will be in one position. In the following frame, this position is changed. The result, therefore, is an imperfect registry, and an imperfect registry will always produce a color-fringe. This color-fringe cannot be eliminated. It may be reduced somewhat through a greatly increased speed in taking the negative, but when such a negative is then projected, it has the appearance of slow motion pictures and the effect is rather comical.

Books could be written on the subject of additive photography, and the various methods that have been developed by such capable scientists and inventors as Urban & Smith, Gaumont, Friese-Greene, Horst, Busch, Pillny, Szeapanik, Keller-Dorian, etc. However, as far as the additive (that is, the optical method) is concerned, it may be discarded as commercially impractical, and this in spite of the fact that, so far, the best colors have been produced by it.

In view of the fact that the scientists realize the insurmountable shortcomings of the additive method, they have devoted a great deal of time and

much effort to the development of the "subtractive" (mechanical method). A good many methods have been developed, such as the Technicolor, Brewster, Prizma, Kelly, Colorchrom, Multicolor, and a good many others. The subtractive or mechanical method is purely a two-color process, with a great many limitations. Its manufacture is very complicated and is possible only through the use of highly complicated and expensive machinery, and because of this, the method is limited to use by only very well equipped and highly scientific laboratories.

## Negative Production Difficult

In the production of the negative film, it is necessary to use a negative material that is twice as wide as the normal black and white film or twice as long. It is also necessary to use a special camera for the production of the negatives. This camera must be equipped with prisms or mirrors which separate the rays to obtain color separation. In the use of this type of camera, the same difficulties, are encountered as in the optical method through the use of contrast filters, which causes a tremendous loss of light, and because of this only very highly skilled photographers succeed in obtaining a negative that can be used.

The development of the negative that is so obtained is rather difficult. To go into the highly scientific details of the subtractive methods is impossible through lack of space. However, if I point out the biggest difficulties of the "subtractive" or mechanical method, I have accomplished all that, I believe, my readers could desire. This is the difficulty: To obtain a print from such a negative is the most difficult part of the subtractive process, and therefore, the positive must either be double-coated (a coat of emulsion on each side of the celluloid), or the printing must be done twice by superimposing. And it is here that the great difficulty lies, which produces an endless chain of trouble for the printer.

## Sprocket Hole Problem

It is common knowledge that it is impossible to get absolutely evenly divided and distributed sprocket holes on the celluloid. No machine has been devised that could accomplish this with mathematical precision. And, as long as we cannot get perfect perforations, we cannot get perfect registry in print, so that the two superimposed pictures register in the proper manner as to avoid color-fringes. The subtractive or mechanical method due to its very nature, produces bright and clear pictures



only in close-ups, or of objects that were photographed from a few feet distance from the lens. The moment a distant object, at, let us say, fifteen or twenty feet away, is taken, the picture becomes dark and the colors are indistinguishable.

The subtractive method, besides being very complicated, offers no safety in manufacture, and is very expensive. It costs anywhere from five to ten times as much as black and white photography. And, it is only a two-color system—in other words, a combination of red and bluish green, which never produces really natural colors, never produces a pure white and cannot produce a pure black. Experts admit that the subtractive or mechanical method is not a solution to the problem of natural color photography.

#### "Auto-Chrom" Method Recommended

Now we come to the last method. The "auto-chrom" method (called the chemical method) is the ideal solution, but no one has succeeded in perfecting a method that could be used for film and paper photography. Lumière was the first to produce a chemical process with excellent results, but it was limited to the use of transparencies and lantern slides. He has not, however, succeeded in adapting this method to films or paper photography. The auto-chrom can be briefly described in the following manner:

In producing the normal black and white emulsion, flower dust, starch grains or similar materials are dyed in the three basic colors of red, yellow and blue, and mixed with the emulsion. If this emulsion is placed onto the plate or film negative, it is possible to obtain a natural color negative. The trouble with this method, however, is that it is too "slow." In other words, the time of exposure necessary to obtain good colors is too long. For this reason, it cannot be adapted to motion pictures.

Besides this, if these flower dust or starch grain particles are too small, the intensity of the colors is reduced, and if they are too large, the picture will be full of color spots and practically no colors will be visible. The auto-chrom method has received a lot of attention, and hundreds of thousands of dollars have been invested in an effort to make it available for film and paper photography purposes, without success. It is very improbable that it will be possible to produce a method that will be commercially feasible. For the last ten years, the auto-chrom method has only been able to be used in connection with transparencies and lantern slides, and it is very likely that its use will remain in this particular field.

#### Necessary Developments

Having covered the above three methods, we have practically exhausted the known principles for the

production of color photography, and it is a regrettable fact that none of them permits the development of a method of color photography and color cinematography that justifies universal adoption. The process that expects to solve the problem of natural color photography and natural color cinematography must meet the following specifications:

a. The possibility for the use of a normal and standard equipped camera without the least change in same.

b. The negative, as well as the positive, film must be coated with a photographic emulsion only on one side of the celluloid base, the same as a black and white film.

c. The development and printing of the negatives, as well as the tinting and toning of the positive prints, must be as simple as black and white work. The positive must give perfect and natural coloring and these prints must not substantially exceed the cost of a black and white print.

d. The projection of a color film should not require special projection apparatus which necessitates the discarding of the present theatrical equipment.

e. In the projection of the film on a screen it must not show any "color fringes," which is the fault of most known processes. Neither must the projection require much more light than the projection of a normal black and white film.

Any process that can meet the above specifications will solve the problem of natural color cinematography and will undoubtedly find a universal and profitable adoption by producers of professional film and by amateurs throughout the world.

### Re-Position the Sound Track

*A Commentary on the Recent Interesting Contribution of John H. Weaver Editor,*

MOTION PICTURE PROJECTIONIST.

Sir: With reference to the story of Mr. John H. Weaver on page 34 of your January issue, entitled "Re-position the Sound Track," I should like to send you the enclosed sample of a

sound-film positive print which was produced in 1925 by the Triergon Company of Berlin (see accompanying illustration).

You will remember that this company was the first to deal with sound-on-film in Europe, and William Fox secured the rights of their patents for the United States a long time ago, using them for his first activities with Movietone.

The Triergon inventors had their sound track outside the sprocket holes just as Mr. Weaver is suggesting, but they increased the width of the film by one-fifth, namely, they had a film of 42 mm. instead of the conventional 35 mm. size. As soon as further developments made it necessary to use international standard dimensions for the German sound films, the German Tobis Company, which had meanwhile taken over the Triergon rights, abandoned Triergon's method of registering outside the sprocket holes, and have been using since that time (1928), the same positive film as all the other international producers.

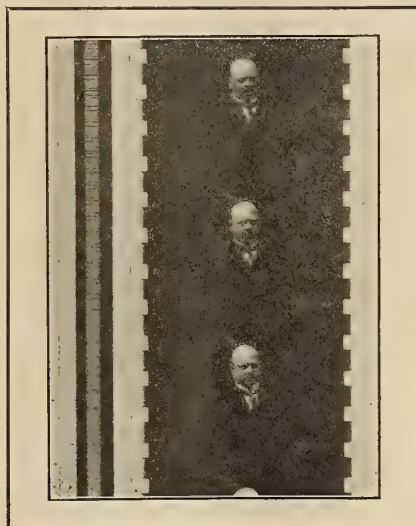
It would be a matter for surprise if one now reverted again to the former methods.—DR. HANS BOEHM, *Associated Sound Film Industries, Ltd., Wembley Park, Middlesex, England.*

### Highly Efficient 16 mm. Lamp

The first 75-volt, 375-watt lamp ever perfected for 16 mm. movie projection has just been announced by Bell & Howell. Said to achieve a light intensity more than 40 per cent. greater than was previously available for this type of projection, it depends primarily for its unusual results on a tremendous light concentration. Repeated scientific tests, made under widely varying conditions, are said to justify the statement that Filmo projectors when equipped with this new lamp, can easily project black and white pictures 12 feet wide with entirely satisfactory distinctness and can attain excellent Kodacolor projection on a larger than ordinary screen.

The problem presented to the illumination engineers in developing this new lamp was to concentrate the maximum permissible amount of light upon the small 16 mm. film. Not only was it desirable to increase the amount of illumination so as to permit showing a large picture of sufficient brightness, but the light must be concentrated in as small a source as possible to focus properly with the optical train of lenses employed in projection, all of which has been successfully accomplished. It is stated that naturally the new lamp, because of the great concentration of light, generates a fair amount of heat, but a projector equipped with an efficient fan cooling system satisfactorily takes care of this situation.

This new 375-watt lamp has opened up a tremendous field for the 16 mm. film. The perfectly safe little 16 mm. projector can now go into the auditorium and assembly hall and show pictures of entirely adequate size, clearness, and brilliance.





# Projection Advisory Council Annual Meeting

**T**HE second annual meeting of the Projection Advisory Council was held at the Hotel Astor, New York City, on February 11th. Following the meeting a luncheon was given in the East Room of the hotel with President William F. Canavan as guest of honor and principal speaker. The luncheon was attended by more than 125 guests representing all branches of the industry. The affair was one of the most successful gatherings ever held in the interest of projection.

Chief among the happenings at the business session was the annual election of officers. All officers of the Council for the past year were re-elected. These officers are: President, Thad C. Barrows, Boston; Executive Vice-President, P. A. McGuire, New York; 1st Vice President, Sidney Burton, Los Angeles; 2nd Vice President, Lawrence Katz, Harrisburg, Pa.; Treasurer, Harry Rubin, New York; Secretary, Laurence Jones, New York; General Counsel, Hirsch E. Stein, New York.

Regional vice presidents also remain the same as last year, as does the entire board of directors. President Barrows is contemplating several changes in committee heads, announcement of which will be made later. Commendation of the manner in which the business of the organization has been conducted for the past year was contained in many communications which were received at the meeting. President Barrows and Executive Vice President P. A. McGuire were singled out for particular praise in this respect.

## Business Session

Other phases of the business session consisted of the reading of annual reports by Treasurer Harry Rubin and by Chairman Joe Cifre of the Membership Committee on their respective duties, and the filing of the reports of various committee heads. Considerable time was given over to consideration of the progress being made with respect to the new standard release print, the campaign on which is now in full swing. Plans were laid for the immediate future regarding the release print standard and other activities which will be undertaken by the Council during the coming year.

A very important work of the Council during the coming twelve months will be the launching of a countrywide campaign to double the membership. The meeting adopted tentatively a plan which will establish a closer relation between the Council and all Local Unions of the International Alliance, with a view to gaining increased support for and in-

terest in the activities of the Council. Further, a close working arrangement with the various Local Unions is looked to by Council officers as a fine opportunity to keep the Council acquainted with the viewpoints and needs of projectionists in various sections of the country. The information thus received in reports from various sections will be collated at Council headquarters and presented to the officers and directors for consideration and recommendation for action.

The luncheon, which was served immediately following the business meeting, was enjoyably informal in nature and productive of many interesting remarks by the speakers.

President Thad Barrows opened the meeting with a brief summary of the results of the business meeting, after which he expressed his appreciation for having been chosen to head the Council for another year. After touching upon the work of the Council during the past year, he closed his address with an expression of confidence in the future of the Council. He then introduced Mike Levee, General Manager of Paramount West Coast Studios and Treasurer of the Academy of Motion Picture Arts and Sciences.

## Producer Interest

Mr. Levee praised the work of the Council and expressed the gratification of the Academy and of the production forces within the industry upon the formation of the Council. Following this he explained in detail various advances which have been made in production work during the past year, particularly with re-

gard to recording. Noiseless recording, he said, was a tremendous step forward for the studios and enabled them to produce motion pictures of a quality comparable to the best stage plays. The importance of the projectionist in the general scheme of things was stressed by Mr. Levee, and he concluded with the observation that the projectionist had done fine work with sound and could be depended upon to do more than his share in the future progress of the industry.

J. P. Lilley of the Pennsylvania State Department of Labor said that an organization such as the Council could be of inestimable service in the classification and codification of the various state laws relating to motion picture exhibition and he urged that definite steps be taken in this direction by the Council.

Brief addresses were made by Harry Rubin, Supervisor of Projection for Publix Theatres; by Sam Kaplan, President of Local Union 306; and by Lester Isaac, Supervisor of Projection for Loew Theatres and first President of the Council.

Nat Golden, Assistant Chief of the U. S. Department of Commerce, gave a most interesting talk during the course of which he paid glowing tribute to Executive Vice President P. A. McGuire for his courage in the face of many difficulties and his unceasing labors in behalf of the Council. Mr. Golden predicted a long and useful existence for the Council, and promised his support.

## Projectionist Aid in Sound

The projectionist was pictured as a courageous, resourceful, and intelligent craftsman by H. M. Wilcox, Vice President of Electrical Research Products, Inc., who went on to point out some of the more serious problems incident to the introduction of sound pictures. The work of organization of ERPI was sketched by Mr. Wilcox. The importance of the role played by the projectionist in the early days of sound pictures and his continued fine work were stressed by Mr. Wilcox.

Characterizing the Council as a tremendous force for good within the industry, I. A. President William F. Canavan stated that to his mind once a year was all too seldom to hold get-togethers. He suggested two or more meetings yearly and stated that this plan would make for a more cohesive organization and better progress in the various undertakings of the Council. While citing the growing importance of all technical workers within the industry, President Canavan said he would like to see a more general understanding among the various branches of the necessity for



Thad Barrows, who has been re-elected President of P. A. C. Barrows heads L. U. 182 of Boston



pleasing the paying patron. He went on to say that, while encouragement should be given to the elevation of craft morale, every worker within the industry should not lose sight of the fact that the efforts of all were directed at putting upon the screen of the theatre the very best product in the very best possible way.

Opinions on the new standard release print continue to be received by the various agencies cooperating in the work of establishing this new standard. The work of classifying these various opinions is now in progress, and it is likely that a complete summary of this together with a report of the Council Technical Co-ordination Committee, comprised of Messrs. Rubin, Burton, and Griffin, will be ready in time for the next issue.

Further opinions on the new standard print are appended hereto:

—Two Rivers, Wisc.—

Sir:—I should like to add my opinion on the new S. R. P. I disagree entirely with V. A. Schauler in regard to the practicability of this plan. I cannot see how any motion picture projectionist who takes an honest pride in his work can tolerate these S. R. P. dots. And who said that the audience doesn't notice them? An ex-projectionist friend of mine approached me recently and asked why I had started to mark up my change-over cues. When I told him that these dots formed an integral part of

a new standard plan, he found it difficult to believe that these dots had the formal backing of the industry.

And another point. We use sound-on-disc only, which means that we are supplied with these damnable combination prints. On several cases where these prints had used sound tracks and been doubled, no dots appeared for the C. O. cues. This makes for a nice cut-over effect—not! As V. Schauler says:—S. M.—Click—C. O., which works out perfectly is properly executed, and only the projectionist is aware of the change-over. —Lester Borst.

—Charlotte, N. C.—

Sir:—I have just finished reading the opinions on the new Standard Release Print in the February issue of MOTION PICTURE PROJECTIONIST and I cannot see how a few more dots or markings will hurt. I had the pleasure of running the first picture cued with this system shown in this city as we do considerable screening and often get them several weeks before they are booked at a theatre, but I must say here is the finish as far as the dot system is concerned. I am supposed to work at the first-run theatre, or at least it is considered the best house in the two Carolinas, but most of the prints we receive have been shipped out to some of the smaller towns before we get them and it is the same old story:—reels one, three, five, seven, and on up the line have been cut.

It was only last week we had a print with all of the change-over dots cut off but one, and of course we had to cue the entire picture over on these

odd reels. I have never seen so many different kind of change-over marks in my life as we are getting now:—punch marks, scratches in all shapes, clicks, tin foil for electric signals, red pencil marks, ink dots, and the latest one is to scratch the sound track so it will make a flutter in the horns. I wrote to fifteen film exchanges in this city and asked for an interview as I wanted to take up with them the proposition of mutilated films and I did receive letters from the United Artists and the M. G. M. Co.'s and they were willing to go into the proposition, providing the other exchanges were interested.

New Year's night a projectionist came over to get a film that we were finishing up on and he asked us not to rewind the film as he wanted to put it together; and he frankly told us he put them all together and intended to keep it up, although he said the film exchanges objected at times. I think the one-man shift has a lot to do with the cutting of reels and it is a proposition from start to finish.

You fellows are doing a wonderful work regardless of what some of the critics may say, and although I may strain my eyeballs looking for those dots that some other fellow has cut off, I'm with you.—W. H. Fowler, President North Carolina State Council of I. A. T. S. E.

—Fairmont, W. Va.—

Sir:—I have been watching very closely the various opinions published in the MOTION PICTURE PROJECTIONIST. Many projectionists have vigorously disapproved the S. R. P. I think that they are a little too hasty with their



General view of luncheon room at Projection Advisory Council annual meeting. Seated at the speakers' table (left to right) 1—Fred J. Dempsey, Gen. Secretary-Treasurer of I.A.T.S.E.; 2—Nat Golden, Asst. Chief, U. S. Department of Commerce; 3—Harry Rubin, Supervisor of Projection, Publix Theatres; 4—Lester Isaac, Supervisor of Projection, Loew Theatres; 5—H. M. Wilcox, vice president, E.R.P.I.; 6—William F. Canavan, President, I.A.T.S.E.; 7—M. C. Levee, General-Manager Paramount West Coast Studios; Thad Barrows, President, P.A.C.; Sam Kaplan, President, L.U. 306; 10—Lawrence Katz, I.A. representative; 11—J. P. Lilley, Penn. State Dept. of Labor; 12—Dr. T. P. McGuire; 13—James J. Finn, Editor, M. P. Projectionist; 14—Chas. Eichhorn, vice president, L.U. 306; Laurence Jones, Secretary, P.A.C.; and P. A. McGuire, executive vice president, P.A.C.



opinions, because of the fact, that the S. R. P. is new to the projection field and we all know that when anything new is introduced it seldom if ever immediately meets all the requirements. These requisites will eventually be solved.

I have always disapproved the use of punch-holes, scratch marks, etc., as change-over cues and I always will. The spots in the S. R. P. are plainly visible to the audience, but they do not detract from the screen as much as the scratch marks, punch-holes, etc. Therefore, I feel that the S. R. P. is a step forward to standardization and better projection; and while it is not the best, I feel certain that a better method will be introduced when the opportunity presents itself. Those that are responsible for the S. R. P. should be congratulated rather than be accused of wrong doing.—*Frank Dudlak.*

—Canon City, Colo.—

Sir:—We have been running the so-called Standard Release Print now for more than a month, hoping from day to day that each new print would mark the beginning of a standard that was really standard. Some prints would have the run-down lower and no change-over cues; other prints would have the cues but with picture and dialogue starting right at the starting frame, with the change-over cue about ten inches from the end of the picture and sound right up to the last frame; others would have a starting cue but no change-over cue.

Thus far—within six weeks—we have had but one or two *standard* prints; the rest have been makeshifts. If this plan does not soon insure some means of keeping the prints really standard, then you will lose at least one believer that the job is possible.—*E. W. McHenry.*

—Elvins, Mo.—

Sir:—Although I am very well pleased with the new standard release print just as it stands I have the following suggestions to offer that might possibly improve it:

1. Place the cues as close as possible in the lower right corner. I do not think the cues as they are are very conspicuous, but placing them in the lower corner would make them even less so.

2. The change-over cue could be omitted on fade-outs, letting it be understood that the change-over is to be made at the completion of the fade where a fade occurs immediately after the S. M. cue.

3. Issue a small cue sheet with each feature picture giving descriptive warning cues about one minute before the S. M. cues. This would help the projectionist to get all cues without having to watch so intently for a very great length of time. Of course this would necessitate printing a small cue sheet and the advantage may not be worth the trouble, but the sheet could also be used for fader cues, running time, special notes to the projectionists, etc.

I am afraid that all the producers are not going to adopt all the characteristics of the standard print. I have run eight or ten prints with the dot change-over method but none were standard in every respect.

The criticism of some projectionists gives me a pain in the neck, some argue that the spots are too conspicuous and annoy the audience; while others contend that the projectionists have to strain their eyes to see them and will miss them entirely if they happen to blink an eye. The chief objection seems to be that they do not want any kind of visual cues. Why not let the theatre managers decide whether or not the visual cues are objectionable and annoy the audience?

Personally I believe the visual cue method to be the best and most accurate one yet devised. A good cue sheet is all right but it too frequently happens that the cues as given are not correct. The trouble with the cue sheet lies in the fact that there is not always any significant action or sound where the cues should be placed that can be described. I notice that some projectionists are ignoring the standard cues and are splicing in blank frames, using the punch and the china pencil as usual.—*Robert Baker.*

### Tube Monopoly Decision May Spur Patent Litigation

The Federal Circuit Court of Appeals, sitting in Philadelphia, affirmed a previous decree of the District Court of Delaware in its decision issued on February 13th that the Radio Corporation of America, the Westinghouse Electric & Manufacturing Company, the American Telephone & Telegraph Company, and several of their subsidiaries, had by their agreements with their licensees attained a "patent pooling" monopoly over the sale of vacuum tubes to dealers and set manufacturers in violation of the Clayton anti-trust act.

The injunction which this decision makes final brings to a close the long drawn-out case of three years' duration instituted by the DeForest Radio Company and several other independent tube manufacturers.

The original injunction ordered against the Radio Corporation by Judge Morris was sustained by the Court of Appeals to which RCA carried the case. When, after a final hearing, he granted a final injunction, the Appellate Court again sustained him, and the latest decision, written by Judge Buffington, senior member of the court, is the final move.

The DeForest Radio Company claimed it had been frozen out of the tube market by the patent pool intended by the Radio Corporation to give it a monopoly in the sale of tubes to its licensee receiver manufacturers and dealers. The Radio Corporation countered that in effect no monopoly had been created, as shown by the increased sales of the plaintiffs. In treating this question Judge Buffington in his decision said, "There is nothing in them (the facts brought out in final hearing), which would lead us to the conclusion that the objectionable contract has not resulted in a monopoly."

This outcome of the DeForest-Radio Corporation case will bring into court several damage suits which have been filed, but awaited the outcome of this case. Moreover, the district court which tried this case will likewise sit in the Federal suit against the Radio Corporation and others, charging that they "have been and are engaged in a combination and conspiracy in restraint of trade."

### Motor Generator Set Requisites

By John Hertner†

THE development of the various light sources for motion picture projection has been very interesting. The changes in light sources used have been brought about more by the needs of the industry than by new developments in lighting itself. For example: at the time the alternating arc was being used it was well known that direct current gave much superior results, but due to the small size of most of the theatres and the less discriminating demand of the public exhibitors were slow in making the change due to expense. The same is true of the use of mercury arc rectifiers and other devices.

More recently the introduction of the low and high intensity lamps followed in the same way, their widespread use began long after their development and on account of demand. The more recent "Hilo" can, however, be considered a new development brought about by an existing need in the industry.

To get the best results in the picture, direct current of as uniform a voltage as possible must be used.

† Hertner Electric Co.

Theoretically, a storage battery would be the ideal source of current as the voltage would then be absolutely uniform and the arc would attain the maximum of quietness. Next to this is a properly designed generator set produces the best results.

#### Line Voltage Fluctuations

The alternating arc, besides changing polarity twice a cycle, has periods of no current and little light. Its shortcomings are too well known to require repetition. The reversing commutator, which is simply a rotary reversing switch driven by a synchronous motor, has the same periods of no current which cause flicker and a noisy arc. The rotary converter overcomes these difficulties, but will still transmit, quite distinctly, line fluctuations into the direct current circuit. In some localities, especially suburban, such fluctuations are quite pronounced.

In the motor generator set where the unit is not overloaded such line fluctuations are practically unnoticed because the motor speed is not affected by a momentary drop or even



failure of the alternating voltage and the inertia of the unit will help to carry it across.

As in all apparatus, a motor generator set must first be reliable. It must be honestly built with plenty of the proper material properly placed and proportioned. It must be built with mechanical and electrical precision, and must be correctly installed.

#### Subject to Overloads

The motion picture set is subjected to heavy overloads. In the smaller sets which are intended for service in houses having only two projectors, it is customary to provide a capacity sufficient to carry continuously the heaviest current either lamp will be called upon to take and have the set take a 100 per cent overload during change-over. While the overload is not so severe from a heat standpoint the generator must be able to carry it without excessive sparking. In the larger units where a diversity of apparatus is supplied with current it is customary to rate with 50 per cent overload for half an hour.

A second important item in the operation of these sets is their ability to maintain their output voltage at the 100 per cent overload point so that when the second arc is started there is no fading of the picture. A momentary dip is to be expected when the second arc is touched, as the inrush on to the second arc at short circuit is heavy, and if the generator is at a considerable distance from the lamp the line drop alone would cause a flicker at this time even with the generator voltage absolutely constant. But when the current is brought to the 200 per cent normal value the output voltage should return close to the full load value. This requires a liberal amount of iron in the circuit of the generator.

If, for example, a generator is operating on say 85 volts, carrying a 50-ampere arc at 55 volts, and the second arc is started, the voltage at approximately 100 amperes drops to 80, then the ballast resistance drop which was 30 becomes 25, a decrease to 86 per cent of its former value. Immediately the current will drop to 42 amperes.

#### Other Requisites

A third point in the satisfactory performance is the production of current with as little voltage ripple as possible. This point was already referred to and is of special importance in the exhibition of sound pictures. Other qualities such as electrical efficiency, good power factor, freedom from noise and mechanical vibration all are important.

Freedom from mechanical vibration and noise may be of prime consideration if the location of the generator is such that the noise or vibration is easily transmitted into the theatre. As a matter of precaution, the design of the theatre should always be such

as to eliminate as much as possible such a condition. There is no good reason why in a modern house the generator should not be located in the basement where a minimum of disturbance will result.

### Systematic 'Trouble' Shooting

Too much stress cannot be laid on the necessity for an orderly and systematic method of locating trouble in a sound picture apparatus. Obviously, to once more cite an analogy, one would not remove the radiator of an automobile if gasoline were not reaching the carburetor, and one would probably begin the search for such a trouble at the tank and then proceed along the gasoline lines, vacuum tank, strainers, etc.

Likewise with an amplifier. If the filaments of a vacuum tube do not light when the switches are turned correctly, it is obviously a waste of time to test the "B" batteries and the many other items that haphazardly come to mind. The filament circuit is an independent circuit and is only a small portion of the amplifier. It is dependent for its supply upon an outside source; and its failure to operate will cause an entire amplifier to be inoperative.

#### Tube Failure

To pursue the analogy: if one finds that there is no gasoline reaching the carburetor, one does not take it all apart and ruin its adjustment. Therefore, why condemn six or eight vacuum tubes until it is definitely established whether the filament supply is reaching them? It is here so much better to begin a test at the "A" battery. If a system has a charging and distributing panel, test at the panel first and make sure that the "A" battery supply is leaving "okay" at the amplifier side or at the set of terminals electrically closest to the amplifier. Test at the connections to the amplifier and finally at the tube sockets themselves.

When two or more tubes fail to function, the trouble will be found to be exterior to all of them, except in the case of a "short" in one of the sockets which is blowing a fuse that protects one or more tubes. Sockets are usually marked, but, if possible, disconnect the "B" battery supply before testing at the sockets. This will prevent possible personal burns and damage to the equipment.

#### Locating the Trouble

Somewhere along the filament circuit the trouble will be found. It may be a dirty or corroded battery terminal or switch, a blown fuse, a loose connection at the back of the charging panel, or, in the case of a single tube in the amplifier itself, a dirty tube prong or contact spring in the socket. In all cases the location of the trouble will suggest its own remedy. There is no great difficulty in clearing an electrical trouble—that

is, with equipment that has once worked satisfactory. The difficulty lies rather in *locating* the trouble. A drawing is essential to the proper location of trouble in all the larger sound picture systems, and it is suggested that drawings of various sections of the equipment, which will be published in these pages soon, be saved for future reference.

#### Types of Drawings

If modifications have been made to equipments for which you already have drawings, it is not unlikely that the attending engineer will be glad to make such corrections as are necessary to bring them up to date. There are two types of drawings. One is known as a theory drawing and is the type commonly used — except, of course, in extremely difficult cases of trouble. The theory drawing consists of only the parts laid out in a form most convenient for the draftsman and with the connections made at the most convenient place on the drawing. These drawings are correct in theory, but they rarely show the connections as they are actually made in the panel.

A wiring diagram, on the other hand, does not lend itself readily to easy reading, but it does portray accurately every connection at the exact point at which it is made in the amplifier or panel. In addition, it usually states the wire colors and shows the cables and wire sizes to be connected and also gives the location of the equipment on the panel. This type of diagram is seldom used in trouble searching except where laced cable forms are used and the trouble is suspected to be in the form or immediately associated equipment.

#### Extraneous Noise

After an amplifier has been in use for some time, trouble may be experienced from faulty contacts between the tube tips and socket prongs. Crackling and frying noises, reduced volume, and sometimes total inaudibility may result. The reason for the trouble may be the gradual formation of corrosion on the socket prongs and on the tube tips, which makes a high-resistance joint, or the trouble may be due to the socket prongs being bent down too far. The latter is often the case. Frequent changing of tubes in sockets is also responsible for this trouble.

The prongs can be lifted up again with the aid of an ordinary button-hook. Another reason for a loose socket prong is the loosening of the screw-and-nut assembly, which holds the socket prong in place. Some types of sockets have prongs which make a "wipe" contact on the tube tips, when the tube is removed and oftentimes, the prongs of the socket are so tight that it pulls the soldered ends of the tube tips. The tension of socket prongs should be adjusted carefully. When adjusting socket prongs, be positive that the filament and plate circuits are disconnected.



## Efficient Sound Reproduction

By R. H. McCullough

*Supervisor of Projection, Fox West Coast Theatres*

**D**ON'T guess at troubles with sound equipment. The method of testing for sound in the Movietone mechanism and also the magnetic reproducer is the same with all systems. Many projectionists have the habit of threading the sound projector mechanism for the mere fact of finding out if the Movietone sound system was functioning. This is a waste of time, as it is very easy to check Movietone by passing your finger quickly up and down through the light flux, with the light gate removed, entering the photoelectric cell, with all meters set at their operating values and the fader on normal setting. A thump will be perceptible at each interruption in the light path during this test which will be proof that the Movietone system is functioning properly.

It has been noticed that projectionists test the Movietone system by touching the positive lead of the photoelectric cell, and after hearing the crackling noise they would assume that the system was functioning properly. If this method of testing is used some time or other the photoelectric cell may be dead, and when starting the projector it will be found that no sound is coming from the Movietone unit.

Most tests have their limitations. Projectionists and engineers will find that interrupting the light source entering the photoelectric cell is the best and quickest method for testing for sound with Movietone. The importance of making tests before the show starts cannot be over-emphasized.

### Balancing Projectors

It is important, however, that both projectors be balanced equally for sound reproduction. If they are not, the level of sound will be disturbed when changing from one projector to another. To meet this situation with Movietone, the Western Electric have in use, with their sound projector system, what is called a 701-A apparatus unit, which is a small block in the case supporting the 49-A amplifier. This block is called the attenuator. It has a series of resistances connected in the shape of a T, and also a series of steps with a connecting link between resistances, which introduce different losses increasing in 3 db steps.

The top part of the attenuator is used for the purpose of balancing the energy level of both projectors, which has nine steps, with connecting links. The first step on top of the attenuator is 6 db and the remainder is in steps of 3 db each.

Photoelectric cells differ in energy output and therefore it is necessary

to equally balance both projectors by changing the taps on the attenuator. The fader steps are 3 db each. Usually the projectionist can tell by the setting on the fader how much lower or higher one projector is than the other by running film with the same sound track on both projectors, and by turning the fader from the red to the white projector and vice versa.

One of the best methods for balancing Movietone projectors is to use endless loops, which can be very easily threaded and removed. When using the endless loop for this purpose, it is only necessary to thread the Movietone mechanism. It will be found that by using the endless loop for this purpose checking the energy level can be done much quicker and more satisfactorily.

The lower part of the attenuator is used for providing a means for balancing disc reproduction as compared to the film. The attenuator is not connected in the disc circuit. It is connected in film pick-up amplifier circuit only. Usually the film reproduction level is higher than the disc. There are three steps on the lower part of the film attenuator of 3 db each. We term the lower part of this attenuator as the machine attenuator as it takes care of balancing the energy level between the disc and film. Each individual Western Electric sound projector has its own attenuator.

### Open Circuits

Open circuits often occur in rheostats. This trouble can easily be detected by means of a continuity test with the headset and C-battery, the testing tips being held to the terminals. Rheostats may be open-circuited owing to a loose slider. Sometimes the shaft of the rheostat may have developed some play, or the whole assembly may have become loose on account of handling or constant vibration. The slider may also have been accidentally bent, which usually can readily be remedied by bending it back to its normal position.

In some cases after a rheostat has been in use for some time, the resistance wire may become coated with an oxide, caused by the heating of the wire. The first symptom of this trouble is a scratchy sound when the slider is rotated over the wire. In extreme cases, parts of the winding may be covered with so much oxide that no current will flow from this section of the winding to the contacting slider. To prevent this trouble, take a rag, moisten with very light oil and rub off the oxide from the winding along the contact path, being careful not to bend the slider. Wipe off the oil afterward with a cloth

moistened with alcohol. When replacing a rheostat, be sure to get one of the same resistance value as the defective one to be replaced.

As the grid element of an amplifier vacuum tube is extremely sensitive and controls the action of the tube by letting more or less plate current pass in synchronism with the fluctuations of voltage applied to it, the grid circuits must be in good condition if satisfactory results are expected. The most common troubles encountered in grid circuits are high-resistance joints and open circuits, faulty connections, short circuits, grounds, induction troubles and correct values of grid leak and condenser, and faulty by-pass condensers.

### Flux-Insulated Joints

High-resistance joints and open circuits may be found in the wiring, owing to a broken joint, which has been poorly soldered, a flux-insulated or corroded joint. Such defects can sometimes be found by testing with a headset and a C-battery. "Cold" soldered joints which can be detected by their rough and ragged appearance, should be re-soldered. The soldering iron should be kept on the joint until all the solder is melted and has a smooth surface as soon as the iron is removed. Flux-insulated joints can readily be wiped clean with a rag saturated in alcohol. The practice of wiping soldered connections in this way should be observed when any work of this kind is done.

High resistance caused by corrosion may result if all the flux is not wiped off, for most flux contains a certain amount of acid, which eats down into the wire and leaves an insulating crust. Acid flux should never be used on amplifier circuit connections. Uncontrollable whistling and howling in amplifiers is often caused by pick-up on grid leaks. All electrical conductors through which pulsating currents flow, set up an electro-magnetic field around them, the lines of force of which are at right angles to the conductor. This field induces currents in other wires running through it.

### Exciter Lamp Discoloration

Discoloration usually appears first at the top of the exciting lamp, which does not obstruct the intensity of the filament image. When checking a lamp for discoloration, remove the lamp holder from the exciting lamp housing and look at the lamp against a white background, this will give you positive proof of discoloration at the top and walls of the globe. Make sure the glass is perfectly clear and clean in front of the filament.

Again, warning should be issued against lamps with saggy filaments. When the filament becomes slightly saggy, discard the lamp. Inspect sound lamps daily, and be assured against loss in volume and injury to sound film reproduction.



## Everyday Science

### Loss of Vocal Chords No Complete Bar to Speech

People who have been unfortunate enough to lose their vocal chords through disease, find it possible to carry on conversation by means of an artificial larynx and synthetic lung which has been developed as a by-product of research work in the Bell Telephone Laboratories.

Several hundred people in the United States today are able to carry on conversation through the use of this device. A train dispatcher in Louisiana carries on his work over the telephone by use of this synthetic talking device. Not long ago an official of the Bell Telephone Laboratories carried on a conversation over 3,000 miles of wire with an architect in California who had become able to speak by using this device. Both speakers utilized the synthetic lung to carry on this conversation.

#### Introduce Sound Into Brain

Another interesting and remarkable device developed in the laboratories is one which is capable of projecting sound directly into the human brain without the use of the ear, as in the case of a man totally deaf. In using this instrument no sound is audible, but the effect of distant music or sound is conveyed directly to the brain of the person affected.

### Use Gas-Heated Switches To Keep Lines Open

Continuous and regular service on steam roads during snow and sleet storms is dependent very largely on the ability of the railway company to keep its switches from freezing up. In railroad terminals a gap of only an eighth of an inch between switch points is sufficient sometimes to tie up the entire system of tracks. The usual procedure to keep switches free is to have them shoveled and swept clean by a gang of men, and to use burning oil to heat the switches to prevent the formation of ice or packed snow between the points.

Several years ago an electric heater for switches was tried out successfully. Recently, city gas has been used for the same purpose, and installations have been made in Philadelphia and Chicago which have operated with marked success during the recent heavy snow and sleet storms. By means of this device, one or two men can take care of an entire terminal in place of a large gang heretofore used.

#### How System Works

Gas is piped throughout the terminal yards, with a burner placed midway between the switch points and

the rail adjoining. This pipe is insulated by means of a special joint to prevent any interruption of electrical signaling apparatus.

When the storm commences, the gas is turned on in the system from a central point, the burner at each switch being lighted by means of a manually-operated lighter. The burning gas heats the steel sufficiently to prevent the formation of ice and makes it hot enough to melt and evaporate the snow or sleet. The entire switch is heated so that it is kept free its full length at all times. The supply of gas is regulated to meet the particular wind or temperature conditions. From 20 to 25 cubic feet of gas are burned per switch per hour and tests with wind velocities up to 45 miles per hour have shown that the heaters continue to operate even under such adverse conditions.

### Telephone Typewriter Grows Steadily in Popularity

The use of the telephone typewriter, by which written messages can be transmitted by telephone and duplicated at any point desired, has grown steadily from 1917, when there were only 26 stations in service, to 1,651 at the end of 1928. These are used by the press services, large corporations, banks, police departments, general commercial use, etc.

#### 245,000 Miles of Wire Used

At the present time, approximately 245,000 miles of wire are used in furnishing this communication service, which reaches every state and includes connections with Canada and Cuba.

This is the youngest of the special telephone services rendered by the telephone companies in the United States and one which seems to be destined for much wider use.

### Radio Tubes Wear 'Pants'

That radio tubes now wear pants may come as a distinct shock to many of us. It is a speedy age when things must be done rapidly and well. Radio tubes are expected to get to work within a few seconds after the switch is snapped on, and that is why they have put on pants to facilitate a recording-breaking dash while retaining utmost reliability and long life.

"Pants" is the name given to an unique form of filament insulation employed in some of the quick-heating A. C. radio tubes now available. Tiny tubes of crolite or highly refined ceramic material measuring 20- to 25 one-thousandths of an inch outside diameter—about the size of your automatic pencil lead—with a hole 8-

to 12 one-thousandths of an inch in diameter, are slipped over each leg of the hair-pin heating filament which is then placed inside the metallic cathode sleeve. Thus the filament is fully insulated and cannot short-circuit or establish contact with the cathode sleeve. Also, the minimum bulk of insulating material results in maximum heating speed, as contrasted with the solid twin-hole insulator tubing employed in earlier A. C. heater tubes. The pants insulator takes its place alongside the flat twin-hole and the notched twin-hole crolite tubing the reduced bulk of which makes for quick heating without sacrificing reliability and long life.

### Causes and Effects of Worn-out Vacuum Tubes

A very important reason for a new vacuum tube giving satisfactory performance is because a copious supply of electrons is available. These electrons are supplied by the cathode or filament of the tube and are projected from the filament or cathode when heat is applied to the filament or heater. Present day vacuum tubes almost universally employ coated filaments or the coated cathode construction. The active material which produces the electrons is coated on the filament, but during the life of the tube is gradually used up and becomes less active.

Finally, a point is reached where there is insufficient emission to give any results. Long before this point is reached, however, performance is reduced to a point of really unsatisfactory quality. The reason that the filament does not fail altogether is because the coating method of the present day is so efficient that the filaments operate at comparatively low temperature.

#### Loss of Electron Emission

The loss of electron emission may cause impaired set performance in a number of ways. For example, in the case of rectifier tubes the loss of emission means that the rectifier voltage supplied by the tube is reduced to a point which reduces the sensitivity of the set, introduces distortion in the output, and limits the volume at which the set can be operated.

In the case of output tubes, the maximum obtainable volume is reduced. If this reduction in volume is carried to an extreme, the equipment develops an extremely harsh and rasping quality.

#### Age Reduces Quality

Since the supply of electrons from the filament must be adequate to sup-



ply at least twice the normal plate current, as tubes wear out, their quality is greatly reduced. If tubes are operated to the point where the emission is very much reduced, the faults in reproduction generally are obvious. This may take the form of noisiness or a pronounced hum.

One bad tube will impair the performance of the reproducer. But if the other tubes are old, the original volume and tone quality cannot be restored by replacing that one tube alone. The only satisfactory remedy is to renew all tubes at once, and then replace them regularly thereafter.

### Seek Substitute for Platinum

Electrical engineers have developed a new metal alloy to be used in places where platinum has heretofore been principally used. This new alloy is said to be much stronger than any other metal at high temperature, which makes it extremely useful in the construction of internal combustion engines, radio tubes, etc.

It was developed in the Westinghouse research laboratories as a substitute for platinum in the manufacture of filaments for radio tubes, which are also extensively used in telephone practice. It was discovered that the new metal was harder to forge than steel and possessed the quality of remaining very tough at high temperatures where most metals lose their strength.

#### Represents Huge Saving

Already, it is said, the substitution of this metal for platinum is saving \$250,000 a month in the manufacture of radio tubes. Platinum costs approximately \$180 an ounce, where "konel" can be made for a few dollars a pound. "Konel" filaments in radio tubes last approximately 10 times longer than any other filament heretofore used. Tubes with filaments made of this new metal can be operated at 175 degrees colder than tubes with platinum filaments, but with the same emission, thus providing better reception results.

Platinum alloys are used extensively in the manufacture of telephone equipment to provide wearing surfaces for the millions of contacts constantly used in putting through telephone connections.

### All City Dwellers Should Learn First Aid Treatment

Educational policies by which all citizens of cities would be trained in first aid and in the handling of accident cases as one means of combating the ever-increasing toll of death by traffic accidents were urged in recent newspaper interviews in London by Sir Arthur Stanley, head of the Council of the British Red Cross Society, and by Capt. A. N. Cahusac, chief secretary of the St. John Ambulance Association.

Many victims of street accidents are still further injured and not in-

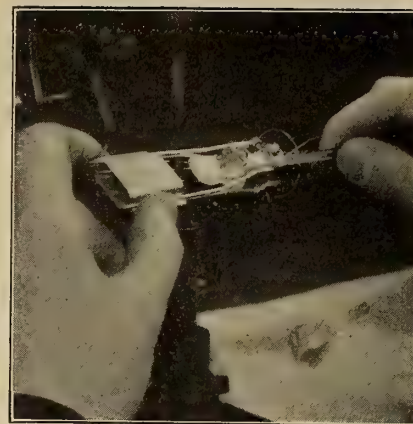
frequently killed, Sir Arthur stated, by ignorant attempts of bystanders to render aid before the ambulance surgeon or other skilled person reaches the scene. In general, he urged, the victim of an accident should be left alone except perhaps to place a low pillow under his head or coverings of coats or other materials over the body as an aid to warmth. Bleeding should be stopped, when necessary, by pressure on the bleeding part either by the hands or by a tourniquet.

#### Unsafe to Lift or Move.

Almost never is it safe to move the victim by lifting or dragging the body until an expert examination has been made. Such lifting of an accident victim often results, the British experts believe, in further serious injuries, especially in cases of fractured bones. Virtually all employees of railway companies, street car companies and similar organizations now are trained in first aid, Captain Cahusac pointed out, as a part of their employment. London policemen are similarly trained.

### A Future Aladdin's Lamp

Presto! A delicate filament wire is made part of an experimental vacuum tube by a silent welding machine in the Westinghouse Research Laboratories at East Pittsburgh, Pa. Each year, thousands of these tiny parts are welded together and placed on the "proving grounds" for vacuum tubes to determine whether the scientific dream of its inventor can brave the rigors of reality. Through this same procedure have marched the vacuum tubes which translate music and speech into electrical impulses, and then, other vacuum tubes retranslate



A Future Alladin's Lamp

these electrical impulses into music and speech all over the world.

In a bank, an electric eye vacuum tube "sees" a robber and sounds the alarm at the same time as it releases a quantity of "crying gas" which forcibly changes the robber's thoughts from theft to fresh air and escape. Among the some 200 other applications of the vacuum tube is the electric ear which separates the various smaller noises that make up the total final noise heard by the human ear. Upon this application is built the hope of a more quiet life in the city by greatly reducing the roar and din, believed to cut a dozen years from the life of the normal person.

The vacuum tube now performs many of the functions performed by man—often better and more completely. It is entirely possible that sometime in the future a vacuum tube able to detect in advance the shadows of coming hard times, prosperity, or imminent revolutions will be created in this laboratory.

## Improvements in Dynamic Speaker Design

By I. B. Serge†

**D**URING the convention of the Radio Manufacturers Association at Atlantic City last June, a meeting was held by the Institute of Radio Engineers. A lengthy discussion on the need for better sound reproducing units was held. Although many engineers are working along new lines in sound reproduction, at the present time the dynamic sound reproducing unit is used universally.

The first dynamic reproducers were designed for home use, and were capable of giving more sound output than necessary. During the past three years, the design of dynamic reproducers for home use was characterized by making them smaller and smaller, and today in the so-called midget set, the weight of copper is in some cases less than one pound. On the other hand, loudspeakers designed for auditorium use were generally similar to those used in the home,

with the exception that the amounts of copper and iron were increased, affording a slight gain in efficiency. This demanded a multiplicity of units in auditorium installations, resulting in the involved problem of inter-connecting them so as to maintain their efficiency.

The sound picture industry has come to realize that better recording and reproducing systems must be developed in order to satisfy the theatregoing public. In this article, we are particularly interested in developments being made to improve the design of the dynamic loudspeaker for auditorium or sound picture installations. The main points of the present development will be reviewed briefly.

#### Multiple Unit Difficulties

It should be understood that most acoustic problems are considered on the basis of a point source of sound. In actual practice where reproducing units are not capable of handling

† Consulting Engineer, Rochester, N. Y.  
S. M. P. E. Trans., Feb., 1930, Vol. 16, No. 2.



large power inputs, the acoustical engineer must employ a number of units, properly phased to approximate the results desired. Obviously the use of a small number of reproducing units leads to few technical difficulties and approaches the ideal of a single point source. Herein lies the first problem—to develop units having large power ratings so that ideal conditions may be approached.

To obtain higher acoustical levels, the designing engineer turns to the dynamic type of loudspeaker. As the power input is increased, the size of the moving coil of the unit must also be increased, in order that the proper heat radiation and mechanical impedance relations may be realized. The moving coil impedance is then chosen to give the best conversion efficiency possible. The conversion efficiency (the ratio of mechanical watts radiated to electrical watts input) varies as the square of the flux density in the air-gap, so that the next problem is that of maintaining a high flux density in the air-gap of the magnetic circuit. By increasing this density the force acting on the cone will increase in direct proportion. This can be done, but the design becomes increasingly more expensive as the air-gap density is increased. There are several reasons for this:

First, the flux density in the air-gap is limited by the saturation density of the magnetic structure; second, it is often difficult to obtain the most suitable materials for this structure; third, in many instances the magnetic structure is not so designed that the maximum useful flux is obtained in the air-gap for a given total flux in the magnetic circuit. In other words, leakage factors are disregarded. The result is that some portion of the magnetic circuit becomes saturated. This requires an excessive magnetizing current in the field coil to obtain the maximum possible density in the gap. Often the desired air-gap density cannot be maintained without subjecting the field to dangerous temperatures. The designer must then pay careful attention to the size of the magnetizing coil, so that the cores pindle does not become saturated.

The face of the air-gap must be increased to provide as large a uniform-density air-gap as economy permits. Most dynamic speakers have too small a face in the air-gap, which results in a variation of impedance detrimental to the efficiency of conversion.

The next step is to so choose a set of dimensions that the leakage flux will be small. In many dynamic speakers, only about 20 per cent of the available flux passes through the air-gap. The remainder leaks between the core and pot and the core and pole plate. With careful design it is possible to increase the useful flux to a value nearly twice as great as this.

The next step is perhaps the most important, viz., the selection of proper magnetic materials. The ideal speaker should have different materials for the core head, core spindle, pot, and pole plates. What alloys should be used is a matter to be determined both by the electrical engineer and the metallurgist. Very encouraging results have been obtained by the use of special alloys, the magnetic specifications of which are generally supplied by the steel manufacturers.

#### Necessary Caution in Design

Finally, the designer must determine the proper number of turns and the resistance of the field windings of the speaker unit. Inasmuch as fewer units are to be used with the improved dynamic speaker, greater power dissipation is permissible in the field winding. Radiation must be provided for the heat produced. In unusual circumstances forced ventilation may have to be resorted to. Mechanical limitations in the design leave a narrow margin for extra radiation factors.

The next question which arises is: will the cone attached to the dynamic speaker, made of thin, light materials, withstand the high conversion ratio of electrical to mechanical energy? Considerable difficulty has been encountered in the past in properly developing the moving coil suspension and the suspension for the cone edge. Practical experience has helped overcome these difficulties and it is now possible to build cones which will withstand quite high conversion ratios.

In the present design it was found that after taking into account all the details outlined above, the sensitivity of the speaker was increased considerably and a fairly flat frequency characteristic was obtained.

#### High Frequency Units Needed

However, the inherent limit of the dynamic speaker—cut-off at high frequencies—is still present. For this reason, special high frequency units must be produced if it is desired to reproduce frequencies above 6,000 to 6,500 cycles per second. A combination of two sound reproducing units with their associated filters and separate amplifiers will cover the audible range desired. This combination, in the opinion of the author, represents the sound picture installation of the future.

The success of the present type of dynamic speaker, as well as those to be developed in the future, depends upon the acoustical coupling placed between the reproducing unit and the auditorium which it is to serve. The so-called baffle horn is very effective and quite satisfactory. However, it is important to understand that each installation is a separate problem, as far as dimensions of the coupling medium and its shape are concerned.

## Electrolytic Condenser Data

Electrolytic condensers are very popular and are useful for certain purposes. They provide a large electrical capacity with a minimum of space and cost. In addition, they automatically repair themselves in event of puncture due to excessive voltage.

Here are the details of construction: There is a metal container, which is employed as the negative terminal of the condenser. In the center there is an aluminum plate, which is corrugated so as to enlarge greatly its surface area. The aluminum plate is the positive terminal. The electrolyte may be a liquid solution of borax or other special material, or may be a paste. In one instance the condenser is called "wet" and in the other "dry."

#### Theory of Operation

In theory, the liquid is supposed to react chemically with the aluminum, forming an extremely thin coating of gas all over the aluminum plate. In this way, the aluminum becomes one terminal of the condenser, and the liquid in the cell the other real terminal. The separating medium or dielectric is only the extremely thin layer of the gas between the liquid and the aluminum. Because of the thinness of this gas layer, the electrical capacity is far greater than with condensers which are separated by paper sheets or other insulating substances. It is important that the aluminum be connected to the plus terminal of the circuit.

#### Mainly for Low Voltages

The electrolytic condenser is principally serviceable for low voltages, but for higher voltages the great capacity available can be utilized by connecting several of these condensers in series. Condensers that serve for up to 500 volts DC are considered "low voltage." Electrolytic condensers can be used on DC only.

## New M-G-M Sound Studio

Construction work aggregating more than \$150,000 has been completed by the Austin Company, engineers and builders, for the Metro-Goldwyn-Mayer Corp. at Culver City, Calif. The projects include the design and construction of a new film laboratory, a sound proof studio, and a plaster shop.

#### \$100,000 Film Laboratory

The film laboratory, representing an investment of \$100,000 is a two-story reinforced concrete structure, 115 feet wide and 140 feet long. The sound proof studio project included the converting of an existing silent picture studio into a talking picture studio, 105 by 300 feet. The plaster shop contract involved the design and construction of a one-story structure 60 by 90 feet.

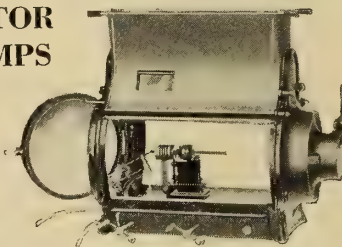




**STRONG**

**HIGH INTENSITY  
AUTOMATIC  
REFLECTOR  
ARC LAMPS**

Provide An  
Abundance of Crisp  
White Light for  
Every Modern Requirement



**REMEMBER**

When You Buy a Strong Lamp  
You Buy the Very Latest Type  
Equipment.

FOR SALE BY INDEPENDENT SUPPLY DEALERS

**The Strong Electric Corporation**

2501 LaGrange St., Toledo, Ohio

Export Office: 44 Whitehall St., New York, N. Y.

## Selected Technical Glossary

(Continued from page 25)

**APPLE** (Colloq.) Audio-frequency vacuum tube.

**AQUARIUM** (Colloq.) Booth in which mixing is done.

**ARC.** Column of very hot, light-emitting gas, carrying an electric current sustaining this condition.

**ARC, MIRROR or REFLECTOR.** Projection arc with a concave mirror placed back of it to reflect and concentrate the light.

**ARE WE PHASED?** See phased.

**ARMATURE.** Device of iron or steel, around or along which are usually wound a number of coils the entire device being placed within a magnetic field so as to concentrate the magnetic flux through itself. Its purpose is to produce currents within itself (as in a generator) or to rotate or vibrate in a desired manner (as in a motor, vibrator, or galvanometer).

**ARTICULATION.** A measure of the intelligibility of speech.

**ASH CAN** (Colloq.) A large multiple arc lamp swung from overhead.

**ASTIGMATISM.** A lens defect which causes blurring (lengthening, broadening, or both) of images.

**ATMOSPHERIC ABSORPTION.** Absorption of energy (sound or light) by air.

**ATTENUATION.** Weakening of intensity.

**AUDIO FREQUENCY.** Frequency of vibration within the limits of good hearing, 20 to about 10,000 cycles per second. Abbreviated a.f.

**AUDIO-FREQUENCY AMPLIFIER.** Magnifies currents whose frequency of alternation lies in the audio-frequency range.

**AUDION.** Three-electrode vacuum tube.

**AUTOMATIC SHUTTER.** See shutter, automatic.

**AUTOTRANSFORMER.** Type of transformer in which primary and secondary coils are partly identical, instead of separate as in the usual type.

**AXIS, LENS or OPTICAL.** See optical axis.

**AXIS OF PROJECTION.** See projection, axis of.

## B

**"B" BATTERY.** Battery (of comparatively high voltage) supplying electromotive force for the plate circuit of a vacuum tube.

**B. A.** Abbreviation for bridging amplifier.

**BABY.** A small spotlight, arc or incandescent; but generally a "Klieg Lilliput," a small light more portable than regular Kleigs.

**BABY TRIPOD.** A small, easily portable camera tripod.

**BACK FOCAL LENGTH.** The distance from the back of the lens to the film in the gate while the image is in focus on the screen.

**BACK-FOCUS.** Distance from the principal focus of a lens (behind the lens) to its nearest face.

**BACKLASH.** "Play" or looseness of a screw or bolt in its fitting.

**BAFFLE.** A portable wall or block for the absorption or reinforcement of sound.

**BAFF.** Contraction of baffle.

**BAFFLE BLANKETS.** Felt, muslin-covered sheets, hung about a set to absorb sound.

**BAFFLE BOARD.** Resonating board in a dynamic cone.

**BAG, CHANGING.** See changing bag.

**BALSAM, CANADA.** Transparent gum used in cementing lenses.

**BAND-PASS FILTER.** See filter, band-pass.

**BAR.** A pressure of one dyne per square centimeter is called a bar.

**BARREL, LENS.** See lens barrel.

**BARREL DISTORTION.** Lens defect which causes the image of parallel lines to bulge outward.

**BARRIER.** The thin blank track between

## Universal Film Splicing Machine

MODEL NO. 3

Pat. March 22:22

First-Class Results on New or Old Film

Permanent Gauge

No Adjusting

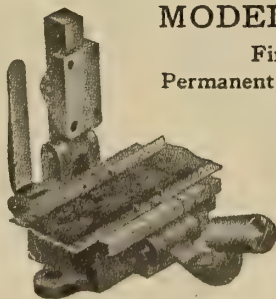
FOR THEATRES, EXCHANGES  
LABORATORIES, SCHOOLS

**Price \$6.00**

**GENERAL MACHINE CO., INC.**

816-826 East 140th St., NEW YORK, N. Y.

For sale by all Supply Dealers





sound track and pictures.

**BASE.** (1) Celluloid component of film. This is the usual meaning of the word in cinematography. (2) In chemistry, a hydroxide.

**BATH.** Any chemical solution used in treating photographic materials.

**BATTERY,** "A," "B," and "C." See respective letters.

**BEATS.** Vibrations produced by interference between two or more wave-lengths.

**BEL.** Equals ten decibels.

**BINAURAL.** Pertaining to both ears.

**BLANKET, MIKE.** See microphone blanket.

**BLEEDING.** Distortion of image, due to spreading of colors, in tinting or toning film.

**BLIMP.** Soundproofed covering built around the camera. Interchangeable term for bungalow.

**BLOOP, noun.** Dull thud emitted in sound reproduction, due to a poorly made blooming patch.

**BLOOP, verb.** To prepare a blooming patch.

**BLOOMING PATCH.** Triangular or oval black section introduced over a splice in the positive sound track, to prevent the noise which the splice would otherwise cause during reproduction. The patch effects a relatively gradual diminution in the transmitted light, followed by gradual restoration to the original value. The sound frequency due to a properly bloomed patch is too low to be heard; but see bloop.

**BLOPS, O. K. ON THE.** See O. K. on the blops.

**BLUE GLASS.** A monocle-shaped glass of special blue tint used by cinematographers to determine color values of a set, when photographing on orthochromatic emulsions, or to judge the lighting conditions on the set when photographing with panchromatic emulsions. (In the latter case the glass is not necessarily blue; any glass of low transmission, with which the cinematographer has had experience, will do.)

**BLUE LIGHT.** In certain studios, signal that monitor man is ready and standing by for a take.

**BOOM, MICROPHONE.** See microphone boom.

**BOOMY.** Same as all bottom.

**BOOTH, CAMERA.** See camera booth.

**BOTTOM.** Low-frequency sounds.

**BOUNCE.** Same as brilliance, particularly with regard to the factor of reverberation.

**BREAKAWAY.** A prop or set that has been especially prepared to fall apart or fracture easily.

**BREAKER, CIRCUIT.** See circuit breaker.

**BREEZING.** Said to occur when projected picture is blurred as a result of distortion of focus in camera, printer, or projector—due to uneven shrinkage of negative or positive, or to perforations of uneven pitch.

**BUILDING AMPLIFIER.** Any amplifier of relatively high input impedance, so that a number of such units may be connected in multiple across a relatively low impedance circuit without materially affecting its electrical condition and without reaction on one another. Abbreviated B.A.

**BRIGHT.** Refers to brilliance.

**BRILLIANCE.** A sound record possesses brilliance if it contains plenty of high frequencies and is therefore rich in overtones, and if it is recorded inadequately reverberant surroundings.

**BROAD, BROADSIDE.** Type of incandescent flood lamp.

**BROMIDING.** As developer is used over and over, bromide is deposited in it by the emulsion developed. The presence of this bromide increases the inertia of the developed film.

**BUCKLING.** Jamming of film in camera, printer, or projector, usually due to intense heat, or to improper threading up.

**BUG.** An insect that flies across the set while the camera is operating, usually requiring that the scene be done over again.

**BULL SWITCH.** Electrical switch for controlling lights.

**BUMPS.** Low-frequency sounds, heard



## HIGH INTENSITY SPOTLIGHT

MORE AND BETTER  
STAGE LIGHTING AT  
LESS EXPENDITURE OF  
ELECTRICAL ENERGY.

MOST REMARKABLE  
RESULTS ON LARGE  
STAGE SETS.

**HALL & CONNOLLY, INC.**

24 Van Dam St.

New York, N. Y.



## Your Preference, Please!

THE editors of THE MOTION PICTURE PROJECTIONIST solicit your aid to the end that this publication may be of the maximum service to you. Every subscriber can do his bit to improve this service by using the space provided below to indicate his preference for special articles and other material in which he may be particularly interested.

Let us know your preference, please. All requests will receive attention in the order of their receipt, so act quickly. Use the blank below to tell us in just what subject you are particularly interested. Do it now!

Editor,

M. P. PROJECTIONIST:

I am interested in the following subjects, on which I should like to see information in THE MOTION PICTURE PROJECTIONIST:

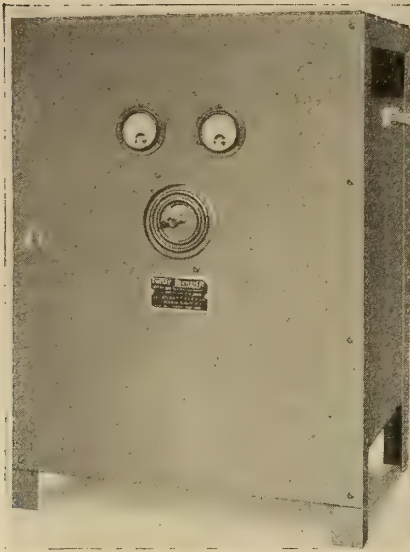
1. ....
2. ....
3. ....
4. ....

NAME .....

ADDRESS .....



## Good Projection Requires Good Rectification



M. P. 25-25

## Good Rectification Means FOREST RECTIFIERS

**T**HIS Forest Rectifier meets the demand for a single unit to supply direct current for two projectors, and will furnish 15 to 25 amperes to either projector continuously.

It supplies a steady direct current, free from pulsations, and will produce a better light than other current supply devices. The only wearing parts are the bulbs which will last at least one thousand hours and usually much longer since only two bulbs are being used at a time (except during change over) and the load is alternately carried first by one set of two tubes then the other two as the projectors are alternately used.

This Forest Rectifier embodies the use of four rectifier tubes which are connected to supply current to two direct current circuits independent of each other thus preventing loss of current at the first arc when the second arc is struck.

Both arcs can be operated at the same time during the change over period and there will be no diminishing of the light from one projector while lighting up the second.

Two Ammeters are mounted on the unit which will show at a glance the amperage being used at either arc.

Links are provided for operating from 110-220 or 240 volts.

Rectifiers for all purposes made in 15 amp., 25-25 amps., 30, and 65 amps. sizes.

*We are specialists in our field. Send us your technical problems. Literature on request.*

## FOREST ELECTRIC CORP.

New and Wilsey Sts.

Newark.

N. J.

in reproduction, due to irregularities in the sound track.

BUNGALOW. Same as blimp.

BURNED UP. Over-exposed.

BUTTERFLY. Silk cloth on frame used to soften light when making exteriors. See diffuser.

BUZZARD. Bad photographic take.

B. X. Same as conduit.

BY-PASS CONDENSER. Condenser used to separate alternating and direct components of current.

### C

"C" BATTERY. Small battery ordinarily used for supplying negative potential in the grid circuit of a three-element vacuum tube.

CABLE. Heavy, well-insulated bundle of wires for conducting electricity.

CAM. In general, a non-circular rotating piece in a mechanism. In particular, the device which operates the intermittent movement of the film in a motion picture camera, printer, or projector.

CAMERA ANGLE. Angle of view taken by the motion picture camera. Usually refers to the horizontal angle but occasionally refers to vertical angle.

CAMERA BOOTH. Soundproof booth, containing cinematographer and his equipment. The camera is operated in this to prevent noise of camera mechanism from reaching microphone. Camera booths are not now in general use, the camera being placed in a blimp.

CAMERA LINES. The boundaries of the region which is in good focus for the camera lens being used.

CAMERA MARKER. Marker (q.v.) for the camera.

CAMERA MOUNT. Any kind of camera support other than a tripod.

CAN. (1) Metal container for film. (2) Ear-phonograph used for monitoring (cf. monitoring (1).)

CANADA BALSAM. Transparent gum used in cementing lenses.

CANARIES. Unidentified high-frequency noises in the recording system.

CANDLE. Abbreviated form of candle-power (2).

CANDLE-POWER. (1) Luminous intensity of a light source, measured in luminous flux emitted per unit solid angle. (2) Unit of candle-power, (1) equal to the luminous intensity of a certain type of standard

candle burning under certain standard conditions.

CAPACITANCE. The measure of the quantity of electricity a condenser can hold. It equals the quantity stored divided by the voltage (pressure) storing it.

CAPACITY. Same as capacitance.

CAPACITY, CARRYING. Current a conductor can carry without becoming overheated.

CAT WALK. Narrow overhead bridge.

CATHODE. Negative terminal of an electric device (cell or tube), from which the current (in the conventional direction) leaves the device.

CENTRE LENS. In a three-lens condenser, the middle one of the three lenses.

CENTIMETER. Unit of length in the metric system. Equal to 0.393,7 inch. Abbreviated cm.

CHANGE-OVER. In projection, the act of changing from one projector to another (preferably without interrupting the continuity of projection); or, the points in the picture at which such a change is made.

CHANGING BAG. Light-tight bag, used in changing undeveloped films.

CHANNEL. A complete set of recording equipment from microphone to film or disc recording units, inclusive.

CHARACTERISTIC, CHARACTERISTIC CURVE. Graph showing the essential features of the performance of a photoelectric cell, vacuum tube, photographic emulsion, or other piece of apparatus. For a film, the curve shows how transmission, or density, varies with exposure (see exposure).

CHOKER, CHOKE COIL. Coil of wire wound on an iron core and thus possessing high inductance.

CHROMATIC. Relating to color.

CHROMATIC ABERRATION. The production of color fringes in the image formed when white light is passed through a lens, due to the fact that the lens bends the light rays of different colors by slightly different amounts.

CHUTE, DOWN THE! Order to send sound into the amplifier room.

CINCHING UP. Tightening a roll of film by holding the center and pulling on the outer end. This is liable to injure the film.

CINOPHOT. Pocket photometer for determining the proper exposure for film.

CIRCLE IN. Same as iris in.

CIRCLE OF CONFUSION. Round image of a point of light not in focus. The circle of least confusion of a lens is the smallest circle of confusion obtainable with the lens by the best possible adjustment of focus.

CIRCLE OUT. Same as iris out.

CIRCUIT - BREAKER. Switch which opens a circuit automatically when the circuit becomes overloaded (or else, for some types of breaker, underloaded).

CLAW. Type of mechanism for intermittent movement. Cf. in-and-out movement.

CLEAN recording channel is one which has practically no unwanted noises in its output.

CLICK YOUR HORN! See horn, click your!

CLICKS, O. K. ON THE! See O. K. on the clicks!

CLIP. Form of snap fastener for making electrical connections.

CLOSE-UP. Picture taken showing characters or objects at a short distance. Lenses for close-ups have generally a focal length greater than three inches.

cm. Abbreviation for centimeter.

COCHLEA. Part of the inner ear in which the auditory nerves terminate.

COEFFICIENT OF SOUND ABSORPTION. When sound energy strikes any substance, it is partly reflected, partly transmitted, and partly absorbed (converted into heat). The percentage of energy absorbed by a given object is the object's absorption coefficient.

COLLECTING LENS. In a three-lens condenser, the lens nearest the light source.

COMMUTATOR. That part of a dynamo that changes direction of currents, so that

## for BRILLIANT SOUND REPRODUCTION

Visitron Photoelectric Cells offer the operator of sound-on-film equipment three decided advantages . . . (1) They practically eliminate "static" noise caused by the amplification of foreign electric currents. (2) They give longer service. (3) Every Visitron cell is guaranteed for six months against defects in materials and workmanship. Throughout their exceptionally long period of dependable service—usually well over a year—Visitrons will bring your theatre the clearest, best-defined "sound" that it is possible to obtain with any given type of sound-on-film equipment. Visitron Photoelectric Cells are distributed through National Theatre Supply Company. Order them from any National Branch or write us direct for further information.



# VISITRON

GM LABORATORIES INC

1803 Grace St.

Chicago, Ill.



the current flowing in the outside circuit will remain dc.

**COMMUTATOR RIPPLE.** Small alternations in the emf produced by a dc generator, due to the operation of the commutator. This ripple is the chief cause of arc hum.

**COMPENSATOR.** (1) Device for regulating speed of a motor, particularly for a film-carrying drum in certain types of sound-recording and reproducing devices. (2) Device regulating voltage supplied to a motor.

**COMPO BOARD.** Contraction of composition board, a common building material in studios.

**COMPOUND LENS.** See lens, compound.

**CONCAVE.** Curved inward.

**CONDENSER.** (1) A device for the temporary storage of electric energy, consisting of two conductors (or else one conductor and ground) separated by an insulator, or of a number of such elements combined to act as a unit. (2) A lens or set of lenses used to focus light upon the aperture of a motion picture projector or into an intense spot of light for use in a motion picture studio.

**CONDENSER, AIR.** Condenser in which the dielectric (insulator) is air.

**CONDENSER, BY-PASS.** See by-pass condenser.

**CONDENSER, DISC.** Kind of condenser, variable.

**CONDENSER, PAPER.** Condenser in which the dielectric (insulator) is paraffin paper.

**CONDENSER, STOPPING.** Condenser used to block flow of dc in a circuit.

**CONDENSER, VARIABLE.** Condenser whose capacitance can be varied at will between certain values.

**CONDENSER LOUDSPEAKER.** Loudspeaker in which the mechanical forces producing the sound are obtained by varying the voltage between two electrodes of a condenser forming a part of an electrical circuit.

**CONDENSER MICROPHONE.** Microphone which transfers sound waves into variations of electric current by acting as a variable condenser.

**CONDENSER TRANSMITTER AMPLIFIER.** A voltage amplifier designed to operate on tiny variations of electric current, and therefore placed directly behind the condenser microphone in a recording system. Abbreviated C.T.A.

**CONDENSING LENS.** Same as condenser (2).

**CONDUIT.** Metal tubing containing two conducting wires insulated from one another and from the tubing.

**CONE, DYNAMIC.** See dynamic cone.

**CONTINUOUS PROJECTOR.** (1) Projector in which the film travels past the aperture with constant velocity, instead of continually starting and stopping as in the intermittent projectors in general use. (2) Also, a projector which automatically shows the same film over and over without rewinding.

**CONTINUOUS WAVES** are those having a constant amplitude.

**CONVERGING LENS.** In a three-lens condenser, the lens nearest the objective.

**CONVERTER.** Machine which employs mechanical rotation in changing electric energy from one form to another, as (1) from dc to ac, or (2) from dc to dc of different voltage, or (3) from ac to dc, or (4) from ac to ac of different number of phases, or (5) from ac to ac of different frequency.

**CONVEX.** Curved outward.

**COOKED.** Over-developed.

**COOLING PLATE.** Shield placed between light source and mechanism, to prevent mechanism from becoming overheated.

**COOPER HEWITT.** (Cooper Hewitt). Common type of mercury vapor arc.

**COOPS.** Slang for Cooper Hewitt arcs.

**COULOMB.** Unit of quantity of electricity; equals the quantity of electricity flowing in one second past any point in a circuit carrying one ampere of dc.

**COUPLING.** When two electric circuits are so placed or interconnected that energy may be transferred from one to the other,

they are said to be coupled. The circuits need not be physically connected; their magnetic fluxes may link, as in a transformer.

c. p. Abbreviation for candle-power.

**CRATER.** Depression that forms in the positive electrode of a carbon arc.

**CRESCENDO.** Climax of sound.

**CROSS LINES.** Fine lines engraved on glass, used in testing for accurate focusing of lenses.

**C. T. A.** Abbreviation for condenser transmitter amplifier.

**CUT OVER (or OVERCUT).** Said to occur when the cutter on a disc recording machine jumps over from one groove to another, due to the application of excessive energy.

**CUTTER.** In disc sound recording, the instrument which cuts the grooves on the wax disc.

**CUTTING ROOM.** Room where the film is assembled or cut.

**CYCLE.** One complete set of the changes of a wave (or other periodic phenomenon), as from crest to trough and back to crest again. May refer to waves of sound, or alternating current, or any other waves or vibrations. Always relative to a second of time; thus "cycles" means 60 cycles per second.

**CYCLE, PICTURE.** See picture cycle.

## D

**DAILIES.** Film which, photographed one day, is developed and printed overnight and screened the next day for the benefit of the director and assistants. Synonym, Rushes.

**DAILY.** Cf. dailies.

**DAMPING.** (1) Gradual steady decrease of wave amplitude, and consequent steady decrease of volume of sound or of electric waves. (2) Removal of echoes or reverberation in a set by use of sound-absorbing materials.

**DARK ROOM.** Room in which film is developed.

db. Abbreviation for decibel.

**DEAD.** (1) Of electric wires, disconnected from circuit. (2) Of sets, enclosed by materials which absorb almost all sound

(Continued on next page)



## Theatre Equipment NEW AND USED

Most complete stock in the U. S. Moving Picture Machines, Screens, Booths, Opera Chairs, Spotlights, Stereopticons, Film Cabinets, Portable Projectors, M. P. Cameras, Generator Sets, Reflecting Arc Lamps, Carbons, Tickets, Mazda Lamps and Supplies.

Projection Machines repaired and overhauled. Repair parts for all makes opera chairs. Attractive 3 x 10 ft. muslim banners, \$1.50; on paper, 50 cents.

We Pay Highest Prices for Used Projection Machines, Opera Chairs, etc. Everything for the Theatre—Write for Catalog K. Movie Supply Co., 844 Wabash Ave., Chicago

## THE BIOSCOPE

The Leading Journal of the British Cinematograph Industry

20th Year of Weekly Publication

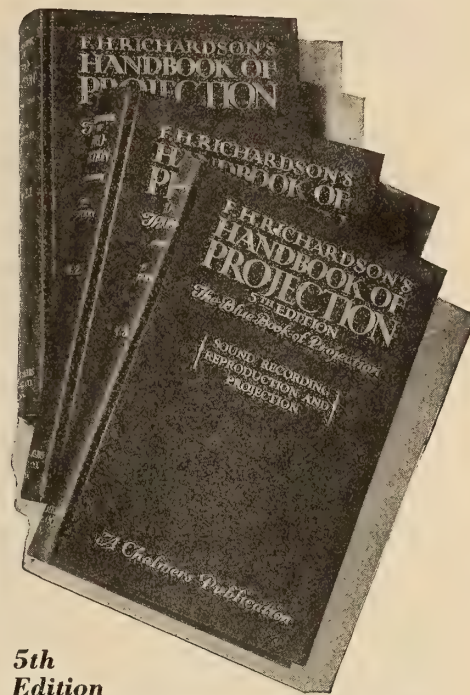
Contains a complete section each week for the special benefit of Projectionists.

Cash prizes awarded for original ideas published. Specimen copies 18 cents.

Annual Subscription 7 dollars 50

THE BIOSCOPE PUBLISHING CO., Ltd.  
8-10 Charing Cross Road, London, W. C. Eng.

## THE BEST SELLER



5th  
Edition

## HANDBOOK OF PROJECTION

By F. H. Richardson

Back in 1910 Mr. Richardson wrote the first Handbook of Projection. It was a sell out. Second, third and fourth editions, each bigger and more successful have followed. The present fifth edition in three separate volumes, illustrated above, is the culmination of years of intensive effort.

Richardson is no swivel chair author. He knows the problems of the field—meets the men on their own ground. His books reflect a practical knowledge of just what information is needed. Recently he completed a 17,000 mile trip through the U. S. and Canada in the interests of projection.

## CONTENTS

Volumes I and II are devoted entirely to the general subject of projection and everything related to it. Volume III deals exclusively with sound projection. All three volumes are profusely illustrated and contain over 1,400 pages of projection information written so you can understand it clearly. Each volume contains Richardson's famous question and answer index giving immediate access to hundreds of different problems.

These are the books which are being used by projectionists and theatre managers all over the world to secure improved results. Send for this finest of projection libraries today.

## USE COUPON TO ORDER

CHALMERS PUB. CO. (M)  
516 Fifth Avenue, New York, N. Y.

Enclosed find (check) (money order) for \$10.25. Send Richardson's 3 volume Hand-

book of Projection to .....

.....

.....

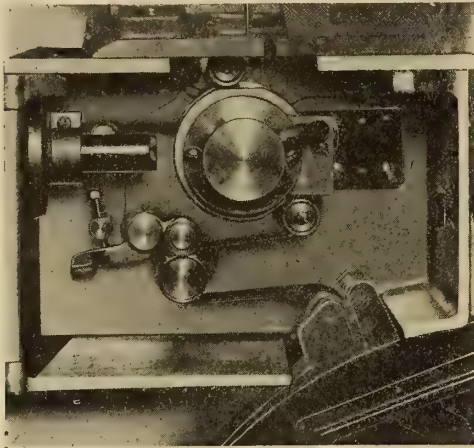
WINNIPEG, CANADA

J. M. RICE & CO., J. M. Rice, Prop. Leading equipment dealers in all kinds of projection room equipment facilities. Representatives of leading equipment manufacturers of the United States and Canada. All our merchandise guaranteed for performance and stability. Whatever you want we will supply it.



More than 1,200 satisfied users of  
**SYNCHROFILM**

are the best guarantee of quality, economy and service



Sound Head for Simplex

For Simplex, Powers, and Motiograph Projectors

**WEBER MACHINE CORP.**

59 RUTTER ST.

Export Department  
 15 Laight St., N. Y. C.

ROCHESTER, NEW YORK

Cable Address  
 "ARLAB" New York

High Points of

**SYNCHROFILM**

No Friction on Film  
 —Rolling Contact  
 Throughout

No Possible Injury to  
 Film

Patented Optical System  
 Delivers Light Beam  
 One-Half Thousandth  
 of One Inch Wide of  
 High Intensity

All Rollers Ball Bearing.  
 All Parts Chromium and  
 Cadmium Plated.

from within the set. (3) Of other apparatus, not functioning.

**DECIBEL.** Unit of gain and loss of energy, intensity, loudness. Equal to ten times the logarithm (to the base 10) of the ratio  $I/I_0$  where  $I$  is final intensity and  $I_0$  is initial intensity in a transmitting system, or (when the decibel is used as an absolute unit)  $I_0$  is a standard intensity. Other names and abbreviations are db, SU, sensation unit; TU, transmission unit. Note: The logarithm of 2 is 0.3 very nearly, therefore intensity is doubled for each gain of 3 db.

**DENSITOMETER.** Apparatus for measuring densities, as of photographic films.

**DENSITY.** (1) Logarithm (to the base 10) of capacity; capacity is the reciprocal of transmission (see transmission). Thus a film transmitting 100% of the light has density 0; transmitting 10%, density 1; transmission 1%, density 2; etc. To add a density of 0.3 is to cut transmission in half. (2) Mass of a substance divided by its volume.

**DENSITY, DIFFUSE.** See diffuse density.

**DENSITY, ENERGY.** See energy density.

**DENSITY, SPECULAR.** See specular density.

**DEPTH OF FIELD.** The range of object distances within which objects are in satisfactory sharp focus in a photograph.

**DEPTH OF FOCUS.** (1) Same as depth of field. (2) The range through which a photographic plate can be moved forward and backward with respect to the lens while maintaining satisfactorily sharp focus on an object at a given distance.

**DEUCE.** Piece of lighting equipment for housing 2-kilowatt incandescent lamp.

**DEVELOPER.** Chemical solution having the property of resolving latent photographic images on exposed film into metallic form.

**DEVELOPMENT.** Process of chemically treating an exposed photographic emulsion to make the latent image visible. For details, see first emulsion, then exposure; also see fixing.

**DIAPHRAGM.** Thin plate, generally metal. In a camera, the iris-like device consisting of movable curved blades which may be adjusted to control the limiting aperture. (See aperture, limiting.) In a microphone, the front vibrating plate.

**DIELECTRIC.** The insulator in a condenser.

**DIFFRACTION.** Bending of waves around an obstacle.

**DIFFUSE DENSITY.** The value of density obtained when transmission is measured for diffuse light—e.g., light transmitted through the negative in a contact printer.

**DIFFUSER.** Device of silk or gauze placed over lights to diffuse the rays. For exteriors, a frame of similar material to diffuse sunlight.

**DIMMER.** Rheostat to regulate intensity of incandescent lamps.

**DISC CONDENSER.** Kind of condenser, variable.

**DISCHARGE TUBE.** A closed tube (generally glass) from which most of the air and other gas has been pumped out, and into which a small amount of inert gas is introduced. This gas is capable of conducting an electric current when voltage is applied to the tube terminals, and, in doing so, will emit light more or less in proportion to the amount of current flowing.

**DISSOLVE.** The gradual change of one scene into another, made by lapping the fade-in of the one on the fade-out of the other. If accomplished by double exposure or double printing on the same strip of film it is known as a lap-dissolve.

**DISTORTION, BARREL.** See barrel distortion.

**DISTORTION, PILLOW.** See pillow distortion.

**DOG LEG.** Kink in the starting spiral on a disc record, due to an imperfection in the spiral-cutting mechanism.

**DOLLY.** Any small rolling platform. Sometimes, specifically, one large enough to

# Hoffmann-Soons

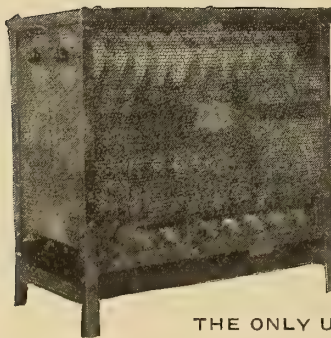
**PERFECTION**

## LOOK AT YOUR LOSSES

Sound screen and color are the hijackers of light rays—taking, with other losses, approximately 80% of your amperages.

In hundreds, if not thousands, of theatres, crowded attendance is thinning out. Profits shrinking. Because pictures are projected with insufficient light.

Swell your box office receipts with the remedy—Perfection Multiple Coil Rheostats, the world's best. Let us mail our new catalog telling all about it.



THE ONLY UNION MADE RHEOSTAT

Sold by Sam Kaplan, and National Theatre Supply Co., New York, and by your dealer.

**HOFFMANN-SOONS**

Electrical and Engineering Corporation

387 First Avenue Mfg. Division New York

Contracting Electrical Engineers—Moving Picture Theatre Electrical Specialists

# RHEOSTATS



## Dismiss Canadian Action of De Forest vs. W. E.

The Exchequer Court at Ottawa, Canada, dismissed on February 13 a suit of De Forest Phonofilm of Canada, Ltd., against Famous Players Canadian Corporation. The suit charged patent infringements on two De Forest patents by theatres of Famous Players Canadian Corporation, involving the use of Western Electric talking picture equipment and films recorded on Western Electric recording equipment.

The action in the Exchequer Court was begun in January, 1929, after

carry the camera, cameraman and director, and used to permit the camera to approach or recede from the scene being photographed.

**DOUBLE EXPOSURE.** Exposure of a negative film at two separate times before development. Two images will then appear combined upon the film when developed.

**DOUBLE MAGAZINE.** A magazine for a camera through which two negatives are to run simultaneously. In such a camera each magazine must have two compartments.

**DOUBLE PRINTING.** Exposure of a positive under two negatives, prior to its development.

**DOUSER.** (1) Manually or (generally) electrically operated door, to cut off the light from the projection lamp from reaching the film. (2) Any door to prevent light from leaving the projection booth or other lamp-house.

**DOWN THE CHUTE!** Send sound into amplifier room!

**DROP THE HORN.** To decrease the volume of sound from the loudspeaker.

**DROP THE MIKE.** To lower the position of the microphone.

**DRUM.** Huge wooden wheel on which film is spun in the drying process after development.

**DRUM, RECORDING.** See recording drum.

**DRUM DEVELOPMENT, or DRUM SYSTEM.** In this method of developing, films are wound spirally on cylinders which are revolved with the lower surface dipping in troughs of developer.

**DRUM MEMBRANE.** Membrane closing the inner end of the trumpet formed by the outer ear.

**DRUNKEN SCREW.** See screw, drunken.

**DUBBING.** Re-recording of all or part of a sound record for the preparation of a new master record, for editorial purposes, for changing volume levels or frequency characteristic, or for changing the recording medium (as from film to disc, or disc to film). Dubbing may or may not involve scoring, partial or complete.

**DUPE.** Negative made from a positive.

**DURALUMIN.** A very hard alloy of aluminum with small amounts of copper, iron, magnesium, silicon and manganese.

**d v Double vibration.** Same as cycle, for sound vibrations.

**DYNAMIC CONE.** Type of loudspeaker in which the modulated electric current passes through a coil placed in a magnetic field. The coil and an attached paper cone vibrate and thus generate sound in accordance with the modulations of the current.

**DYNAMITE.** An open connection box, dangerous if stepped on, into which the studio lamps are plugged.

**DYNAMO.** Machine to convert mechanical into electrical energy.

**DYNAMOTOR.** Type of converter (2).

**DYNE.** Unit of force in the metric system. Approximately 450,000 dynes equal one pound of force. 68,944 dynes per square centimeter equal one pound per square inch.

(To be Continued)



## SUPER-LITE LENSES

WISELY CHOSEN BY  
AMERICA'S BEST THEATRES

### New Bifocal Super-Lite Lens

An adjustable focus lens with a wide range of foci for both silent and sound film.

### Series III. Super-Lite Lens

Standard full Half-Size lens furnished in short focus as low as 4" E. F. and up to 10" E. F.

### Series IV. Super-Lite Lens

Full 3" diameter lens to meet the demand for more light for longer throws. 6" E. F. to 10" E. F.

*Quality Guaranteed*

**PROJECTION OPTICS CO., INC.**

330 Lyell Avenue

ROCHESTER, N. Y.

U. S. A.

## CARBONS COST MONEY



### BEST CARBON SAVER

*for Low Intensity Arcs*

Permits projectionist to get at least one more reel from each set of stubs. Made in 7, 8, 9, 10, 12 and 13 mm. sizes.

**\$2.50 each at your dealer.**

### BEST DEVICES CO.

200 FILM BUILDING - - - - CLEVELAND, OHIO

## KEEP all your COPIES of

MOTION PICTURE PROJECTIONIST  
AS A REFERENCE FOR CURRENT  
AND FUTURE NEEDS—PRE-  
SERVE THEM IN A  
BINDER

**\$3<sup>00</sup>**  
**each**

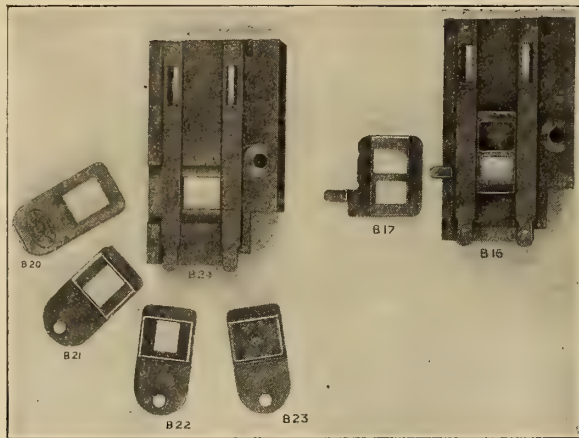
GOOD SOLID  
IMITATION LEATHER  
—GET ONE

ORDER FROM THE MOTION PIC-  
TURE PROJECTIONIST



## BLUE SEAL HEAT RESISTING IMPROVED FILM TRAPS

FOR SIMPLEX PROJECTORS



MADE OF AN IRON  
ALLOY

*Guaranteed not to Warp  
under the intense heat  
of the Arc Spot. A  
necessity for the Per-  
fect Projection of  
"Sound" Pictures*

- B-16—Film Traps with Sliding Double Round Corner Apertures, one Aperture for Disc and Silent Film and one cut Proportional for Movie-tone Film to be used with our Adaptors. \$30
- B-17—Sliding Double Aperture Plate. . . . \$6
- B-24—Film Trap with individual mats for silent, movietone and magnascope effect. Traps complete with all mats. \$30
- B-20—Master Plate to hold mats stationary. \$1.50
- B-21—Standard Aperture with Square Corners. \$1.50
- B-22—Proportional Movie-tone Aperture with Square Corners. \$1.50
- B-23—Blank Mat (CAN BE CUT ANY SIZE APERTURE) . . . \$1.50

Manufactured by

**BLUE SEAL PRODUCTS CO., Inc.**

262 Wyckoff St.

Brooklyn, N. Y.

Manufacturers of Motion Picture Accessories Since 1913

## By Test Proven Best!



\$9.00  
Each

Imagine! Now on their second year of giving satisfactory service to Hi-Lo lamp users everywhere from Coast to Coast. Surely there must be a reason for this preference for the

### GEM CONTACT JAW

Designed right, made right, and priced right.

*Order a Spare Now!*

**FOGELBERG ENGINEERING CO.**

128 S. Clinton St.

Chicago, Ill.

*Sold by Reliable Independent Dealers Everywhere*

## SOUND REELS

For Perfect Projection

**ALL-WELDED TYPE**  
One Unit

**LASTING DURABILITY**

Bright Cadmium Plated

**UNIVERSAL ELECTRIC**  
9-16 Thirty-seventh Ave.,



—All Sizes—

**DEMOUNTABLE TYPE**  
Each side one unit

**ALL PARTS  
REPLACEABLE**

Write for quotations

**WELDING COMPANY**  
Long Island City, N. Y.

similar action begun in September, 1928, and based on somewhat broader grounds had been dismissed by the superior court of Montreal. The second action as originally begun involved the charge of infringement of eight De Forest patents claimed by the plaintiff to be fundamental to the use of sound on film in the talking picture art.

Before trial, however, De Forest Phonofilm of Canada withdrew the charge of infringement on six of these patents, leaving in suit No. 252,491, issued to Lee De Forest on August 11, 1925, and alleged to dominate the method of recording sound on film by means of the so-called flashing lamp; and No. 279,863 issued to Lee De Forest on May 1, 1928, and asserted to cover broadly the combination of sound-on-film reproducing apparatus with a motion picture projector.

### Amplification the Outstanding Problem in Television Work

Undistorted amplification over an enormous frequency range is one of the outstanding problems in radio television. While the ear may be fooled into accepting as perfect an amplification curve which plots like the profile of the Rocky Mountains, the eye immediately detects uneven amplification in its pictorial interpretation. Thus the best transformer coupling will not do except for crude silhouettes. The most advanced form of resistance-coupled amplification is essential for fine half-tone pictures, with a flat frequency response curve up to and beyond 50,000 cycles.

#### Much Recent Progress

Notable progress has been scored in television amplifiers, both at the transmitting and receiving ends. Aside from the proper selection of resistance and capacity values, as well as other circuit considerations, the resistors themselves have received critical consideration. The slightest imperfection in resistors, according to Jesse Marsten, Chief Engineer of International Resistance Company, gives rise to serious pictorial defects. Noisy resistors are detected by blotches in the pictures, similar to those caused by severe static. Uncertain resistance values result in upsetting the delicate gradation of half-tone pictures and breaking up the finer detail of silhouette pictures. Due to the exceptionally high amplification at the pick-up end as well as at the receiving end, the resistors are severely tested in television work.

The high resistance values required make the wire-wound type too costly. The standard resistor employed in television work is the heavy duty or powerohm type of metallized resistor the positive conduction and perfect contacts of which insure noiseless operation together with freedom from moisture due to the special ceramic enclosure.



## A Separate Sound Track

(Continued from page 18)

track. The two heads are tied together by a shaft so that there is no chance of one starting before the other.

### The Binaural Effect

Mr. Phelps: It seems to me that President Crabtree's mention of the binaural effect is worthy of further consideration. I am going to ask if the effect could not be achieved by using two sets of loudspeakers, at opposite sides of the stage, in conjunction with two sound tracks. I think this has dramatic possibilities such as, for example, two characters carrying on a conversation from opposite sides of a wide screen. I should like to hear something on this point.

Mr. Irby: In connection with this, several patents have been issued recently calling for binaural recording as well as reproduction and the tests reported were favorable.

Mr. Hill: Regarding the recording of two sound tracks on separate film and then reproducing each sound track separately by loudspeakers placed on either side of the stage, this does not work out very satisfactorily because of the fact that each ear picks up the sound from both loudspeakers.

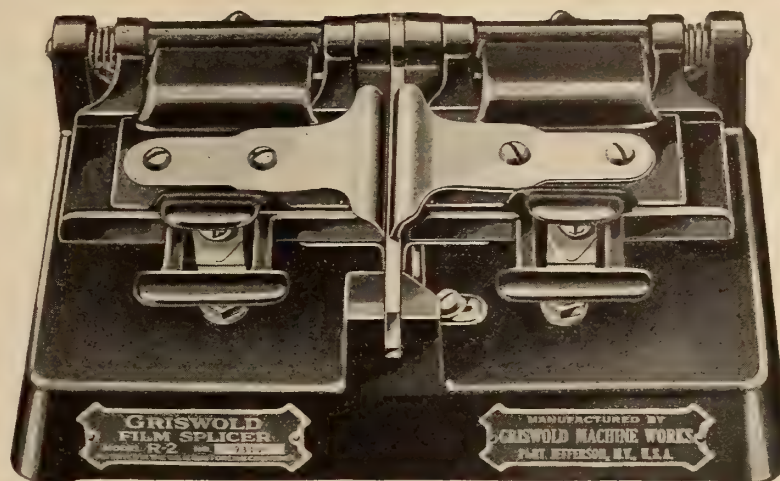
The results of several tests, which have been made, show that if a head set is used for reception and one sound track output applied to each head piece, good binaural effect is produced, due to the fact that the sound from one sound track is received by one ear only. If, however, loudspeakers are used, the binaural effect is almost entirely lost.

Mr. Palmer: I do not see any particular difficulty with regard to space requirements or the synchronizing requirements arising from using a separate sound track. The apparatus for the projection of sound on the separate track need not be any larger than the present film recorder, which takes up very little space. As far as synchronizing is concerned, there is no difficulty in doing this with the projection machine by the present method used in the studio for keeping the sound recorders in step with the camera.

Mr. Edwards: At the Chinese Theater in Hollywood, when the sound recorders were installed the room was packed so that it was almost impossible for the men to walk about. The

### Microphonic Tubes

Most every projectionist has run across a microphonic tube, which could not be used in the photo electric amplifier. A microphonic tube usually produces a howling noise, which increases in volume and rises in pitch, making reproduction impossible. Sometimes the microphonic noise is caused by vibration and sometimes there seems to be no external source of vibration at all.



15,000 Griswold Film Splicers are in constant use daily in theatres throughout the World. The standard film splicer for efficiency, durability and economy.

## GRISWOLD MACHINE WORKS

Port Jefferson, L. I.

New York

IN WESTERN CANADA!

## CANADIAN THEATRE SUPPLY CO.

Authorized distributors for

**SIMPLEX—MOTIOGRAPH—POWERS—HOLMES**

and all theatre equipment of the leading manufacturers. Also, an extensive line of stage equipment.

**Complete Sound Picture Service!**

**306 Canada Building**

**Winnipeg, Man., Canada**

Alberta Representative

**M. L. ADAMSON**

9921—113th St., Edmonton, Alb., Canada

**Give This to Your Friend—Have Him Fill It in and Mail to us at Once**

The Motion Picture Projectionist  
45 West 45th Street, New York City

Gentlemen:

Enclosed please find \$2.00 for which enter my subscription for one year (12 issues) starting with .....issue. (Two years, \$3.00.)

Name .....

Street .....City .....

State .....Local No. ....



equipment consisted of standard bases and heads and two magazines; even the lamp brackets were left on, and with the amount of space taken up a newly designed sound head would be fine. I am not speaking of conditions as they should be, but as they are.

Mr. MacNamara: By courtesy of the Gaiety Theater last night, we witnessed from the projection room the presentation of *Hell's Angels*, and the last speaker's statements were well demonstrated. Minimum amount of space has been allowed in the projection room to permit the men to go from one machine to the other. The extra mechanism—the gearing for the disk recording—was replaced by another for film recording, so that there would be no chance of slipping out of synchronism.

Mr. Barrell: Regarding the remarks made by Mr. Stern, there is no doubt in my mind that it is preferable to use the old silent frame size. A visit to the art museum will indicate that this proportion is favored by artists. Moreover, by increasing the picture size on the screen we increase the apparent graininess of the film. A few months ago I read of a German invention of a film in which the graininess was so small that enormous magnification could be used. There is no question that the picture today is suffering on account of the introduction of sound. I wondered what was being done to reduce graininess and make it possible to place sound or picture in a smaller field than we have at present. We shall work until doomsday striving for proportions better than those of the old silent picture. The seventy millimeter width is adaptable only for certain types of story; it is suitable only for scenery such as Niagara Falls. We must take the tools we have at present, and improve them. Reduce the size of the sound track if possible, and use the time-tried and thoroughly artistic picture frame used for twenty years. We can get into it everything required. We are continually reducing the size, letting the graininess appear, and ruining the quality of the picture.

Mr. Sheppard: I am only going to refer to the last speaker's mention of a process giving extraordinarily high resolution. That process is an old one involving the use of silver aluminates. Its main difficulty is that the speed is so much less than that of the present film, that it would not be of practical use for the present purpose. The question of resolving power *versus* speed is always with us. We have to make a compromise.

#### Advocates Continuous Projection

Mr. Holman: I think these arguments are about the best I have ever heard for continuous projection. The practice of putting sound and picture on the single strip is a matter of convenience. With continuous projection, there is no such trouble from

scratching. It is possible, with continuously moving film strips, to drive the film with one row of perforations, thus preserving the old silent picture area and providing a sound track 50 per cent wider than that used today. Most of the discussion serves very well to show up the advantages of the continuous projector, and a little thought will disclose how many of the industry's serious problems will be solved by adopting continuous projection.

Mr. Raven: In connection with Mr. Barrell's remarks about the destruction of the picture value due to tremendous magnification and his reference to the granules of the film showing up, I think one of the main faults at the present time, on large as well as small pictures, is that we have perforated screens. Taking a smooth, opaque surface, we puncture it with millions of small perforations, and while they cannot be detected at a distance with the naked eye, they are there, and we might just as well have so many tiny black spots on the screen.

Mr. Norling: Graininess seems to be objectionable mostly because the grains are in constant motion on the screen. The small holes in the sound screen are fixed, and are invisible a short distance away from the screen, so that obviously the small holes do not add to the graininess of the picture.

Mr. Ross: Mr. Edwards has called attention to the congested condition of the projection rooms at the Gaiety and Chinese Theaters, where sound was projected on a separate film in the exhibition of *Hell's Angels*. Will Mr. Edwards not be fair enough to admit that the sound heads were temporary apparatus made up to meet an emergency? We have called attention to the fact that by converting the present single-reel upper and lower magazines into two-reel compartment magazines, the present projectors will be no larger than those now equipped for sound employing a single film. We believe that if projector manufacturers would devote as much attention to the redesigning of projectors for separate sound and action film as they have to the adoption of single sound films, all the old projectors could as easily be converted for separate sound films as for single sound films, and at no greater expense or sacrifice of space in the projection booth.

President Crabtree: It may be a coincidence but the best sound quality I have ever heard was in a Broadway theater where the sound and picture were placed on separate films.

An advantage of separate sound and picture films is that each can be developed to its correct gamma much more readily. At present a low degree of development of the picture and sound negatives is in vogue, a practice which is not always conducive to production of the most uniform results.

### Index of Advertisers

Ashcraft Auto Arc Co.....	8
Best Devices Co.....	43
Bioscope, The .....	41
Blue Seal Products Co.....	44
Brenkert Lt. Projec. Co.....	6
Canadian Theatre Supply Co.....	45
Chalmers Publishing Co.....	41
Eastman Kodak Co.....	5
Enterprise Optical Mfg. Co., .....Back Cover	
Fish-Schurman Corp.....	5
Fogelberg Engineering Co.....	44
Forest Electrical Corp.....	40
General Machine Co.....	38
G-M Laboratories, Inc.....	40
Griswold Machine Works.....	45
Hall & Connolly, Inc.....	39
Hoffman & Soons, Inc.....	42
Ilex Optical Co.....Front Cover	
International Projector Corp.....	4
Kaplan, Sam, Mfg. & Supp. Co....	2
Movie Supply Co.....	41
National Carbon Co.....	7
National Theatre Supply Co.....	47
Projection Optics Co.....	43
RCA Photophone, Inc.....	26, 27
Rice, J. M., & Co.....	41
Roth Bros. & Co.....	3
Strong Electric Corp.....	38
Universal Elec. Welding Co.....	44
Weber Machine Corp.....	42
Weston Elec. Inst. Co.....	6



# IN THE PROJECTION ROOM EVERYTHING means something

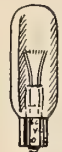


The majority of projection room accessories are, in themselves, small, inexpensive items but they all mean something! Everyone of them will either help you turn out better pictures or place a

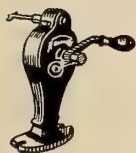


handicap on your ability. National Theatre Supply Company knows and

appreciates the importance of projection room accessories. Throughout



their all inclusive line of up-to-date equipment every individual

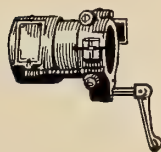


item can be depended upon to do its work reliably and

efficiently. That means something, too . . . It means



so much that every day, an increasing num-



ber of projectionists are learning that

it pays to insist on National



Accessories.



**NATIONAL THEATRE  
SUPPLY COMPANY**  
*Branches in all Principal Cities*



# MOTIOGRAPH DE LUXE COM- PLETE SOUND EQUIPMENT

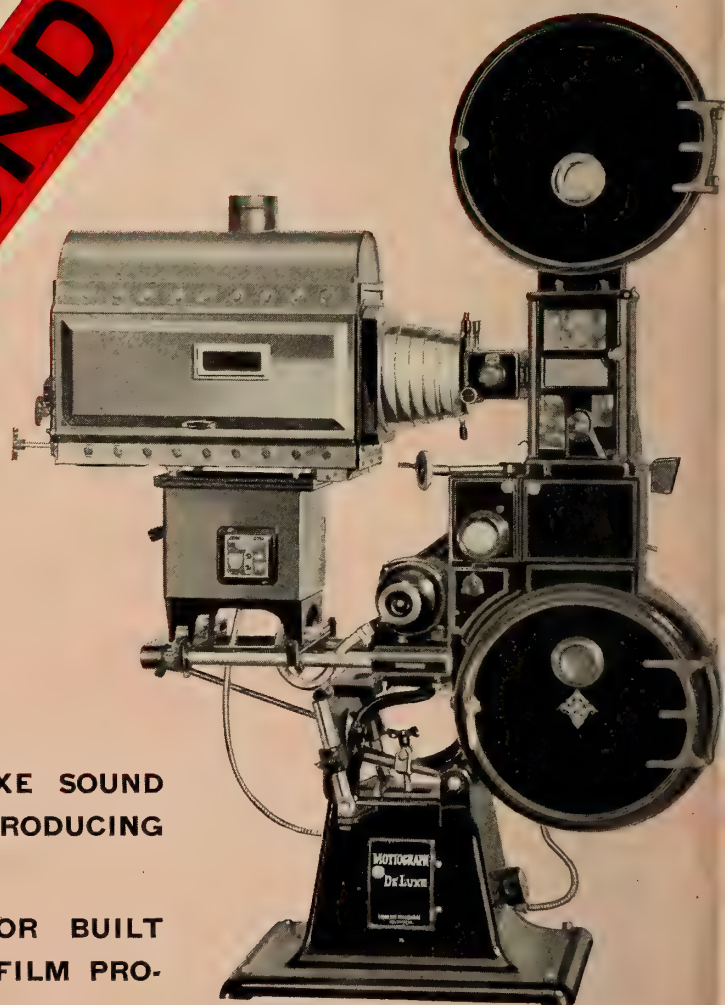
SOUND  
IS NO LONGER  
A NOVELTY



YOUR PATRONS  
DEMAND  
CLEAR PICTURES  
WITH  
TRUE SOUND

THIS EQUIPMENT  
GUARANTEES  
YOU BOTH

**GUARANTEED SOUND EQUIPMENT**



MOTIOGRAPH DE LUXE SOUND  
PROJECTOR FOR REPRODUCING  
SOUND FROM FILM

THE ONLY PROJECTOR BUILT  
PURELY FOR SOUND FILM PRO-  
JECTION

WRITE FOR OUR BOOKLET OF FULL INFORMATION

ENTERPRISE OPTICAL MANUFACTURING CO.,

564 W. RANDOLPH ST.

CHICAGO, ILL.



# MOTION PICTURE PROJECTIONIST

*(Fourth Year of Publication)*

## THE ILEX F:2.5

STANDARD ADJUSTABLE  
PROJECTION LENS

### SHORT FOCAL LENGTHS

A new era in screen presentation brings forth larger pictures and wider screens. "Grandeur" effects from 35mm. film are now possible for every theatre with ILEX, offering the finest short focal length lenses that the present day market affords. This is true because ILEX lenses are corrected for critical definition, maximum sharpness, brilliant illumination and flatness of field. Slop-over and incomplete covering of the screen are cared for by the exclusive ILEX adjustable feature.

For the projection equipment you use, ILEX lenses are the best . . . perfect in performance . . . faithful in service. We can furnish engineering data and interesting literature to cover your projection problems.

ILEX OPTICAL CO. ROCHESTER, N. Y.



FURNISHED IN A WIDE RANGE  
OF FOCAL LENGTHS  
2½" to 9"



OPTICAL PRODUCTS OF PRECISION

# ILEX OPTICAL CO.

INSIST UPON ILEX — THE LENS THAT PUTS PERFECTION IN PROJECTION

A Mancall  
Publication

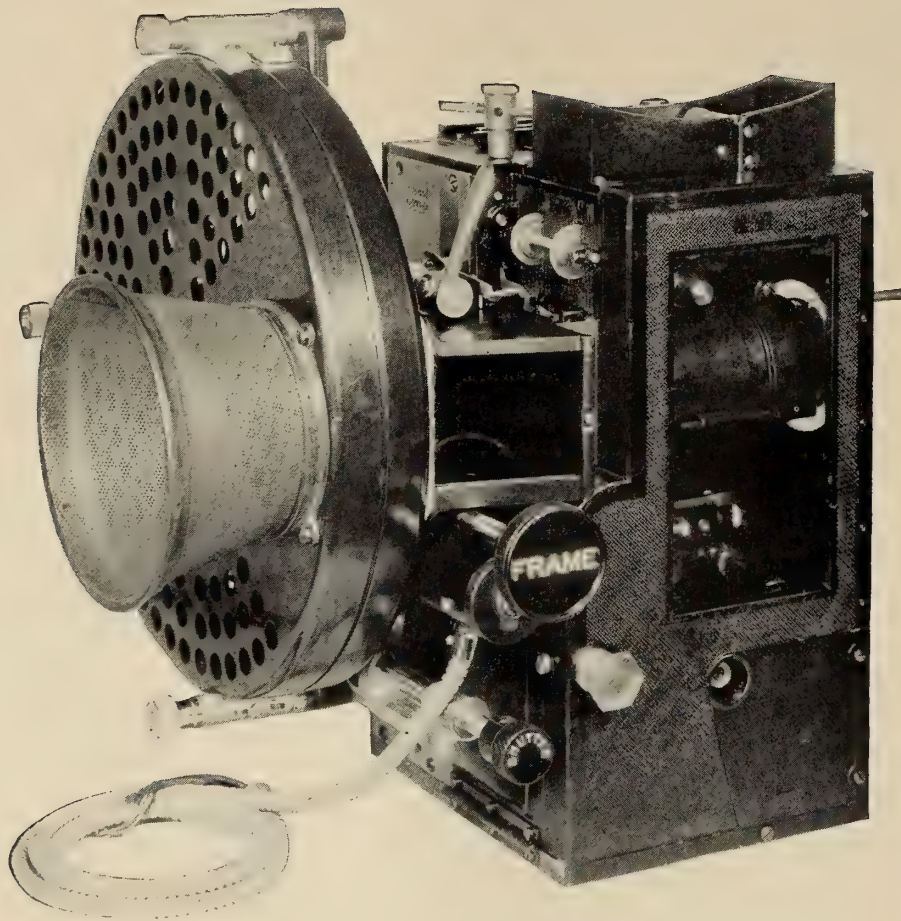
APRIL, 1931

Vol. 4, No. 6  
25c. per copy  
\$2.00 per year



*Now Ready!*

# KAPLAN REAR SHUTTER



Can be Attached to Any Sure-Fit  
or Simplex Mechanism

*See your local dealer or write to us*

Sam Kaplan Manufacturing and Supply Company, Inc.  
729 Seventh Avenue :: New York City



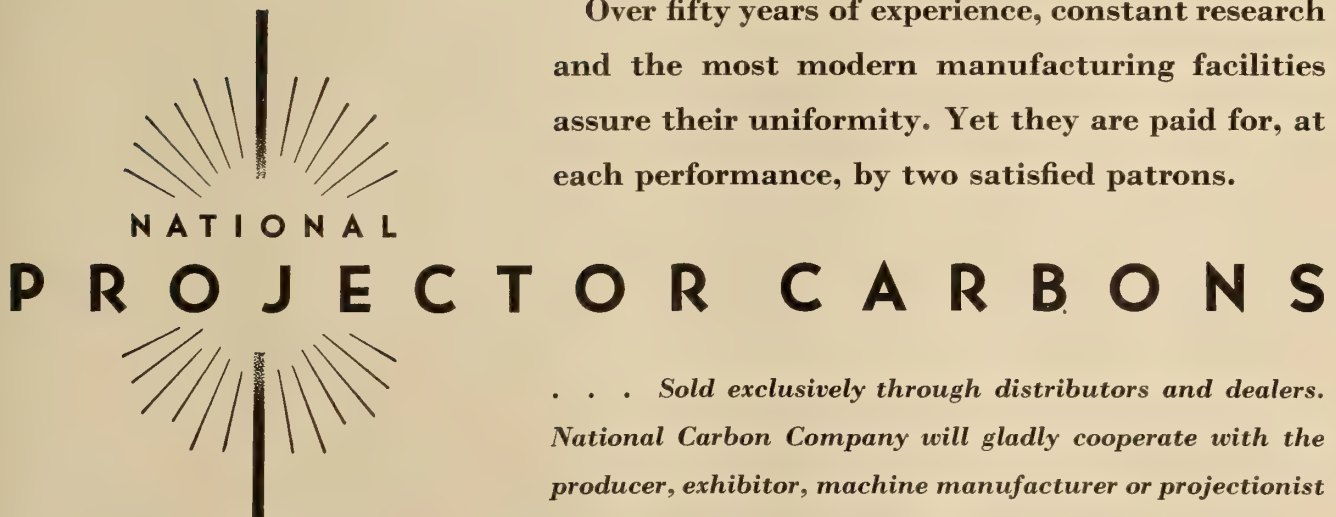
# Sixteen Million to One . . .

**M**OTION picture projection today demands a source of light sixteen million times as brilliant as the screen.

Due to losses through aperture, shutter, film, optical system and screen absorption, only a small percentage of the light from the source is reflected from the screen. This is spread over a picture a half million times the area of the arc crater from which it comes. That is why the crater brilliancy must be sixteen million times the brilliancy of the screen.

National Projector Carbons hold their leadership in the motion picture theatre because they provide a source of steady, white light surpassing the sun in intrinsic brilliancy.

Over fifty years of experience, constant research and the most modern manufacturing facilities assure their uniformity. Yet they are paid for, at each performance, by two satisfied patrons.



*. . . Sold exclusively through distributors and dealers. National Carbon Company will gladly cooperate with the producer, exhibitor, machine manufacturer or projectionist on any problem involving light.*

**NATIONAL CARBON COMPANY, INC.**

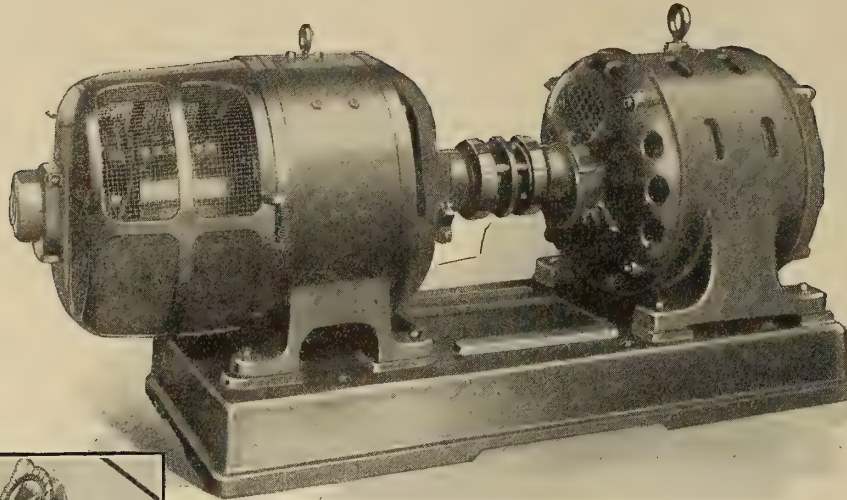
Carbon Sales Division      Cleveland, Ohio

Unit of Union Carbide  and Carbon Corporation

Branch Sales Offices:    New York    Pittsburgh    Chicago    San Francisco



# THEY KEEP A-RUNNING



150/225 to 400/600 Ampere 4-Bearing Actodecor



Paramount-Stapleton Theatre, Staten Island, N. Y., which recently opened. Roth Actodecors as illustrated are used by "Publix" for their finest theatres.

## Always Dependable

Continuous dependability of operation is one of the most important of the many reasons why Roth Actodecors are preferred for projection arc service . . . They supply steady direct current power, of the proper voltage, to the arcs—which results in brilliant screen illumination of uniform intensity, even during changeover . . . Any number of arcs can be carried within the ampere ratings of Roth Multiple Arc Type Actodecors. The sizes range from 20 to 600 amperes . . . Furnished in 2- and 4-bearing types.

### ROTH BROTHERS AND CO.

*Division of Century Electric Company*

1400 W. Adams St.

Chicago, Ill.

*Distributors and Offices in all Principal Cities*

ACDC-4

DIRECT CURRENT  
MOTORS AND  
GENERATORS



MOTOR GENERA-  
TOR SETS AND RO-  
TARY CONVERTORS



# MOTION PICTURE PROJECTIONIST

April, 1931

Vol. 4, No. 6

JAMES J. FINN, Editor

Lester Isaac, *Efficiency*; J. H. Kurlander, *Light*; Thad Barrows, *Conservation*; J. E. Robin, *Equipment*; Samuel Wein, *Research*; R. H. McCullough, *Sound Projection*; Harry Rubin, *Improvement*; Victor Welman, *Personnel*; Sidney Burton, *Production*

Published monthly by Mancall Publishing Corp., 7 West 44th St., New York City. Subscription rates in U. S. and Canada: twenty-five cents per copy; two dollars per year; three dollars for two years. Add one dollar for foreign postage. Changes of address should be submitted three weeks in advance of publication date to insure receipt of current issue. Entered as second class matter Oct. 25, 1927, at Post Office, New York, N. Y., under the act of March 3, 1879. Copyrighted 1931 by Boone Mancall. Additional entry at New Brunswick, New Jersey.

## Canadian Representative

H. N. Elliott, 203 Vaughan Road  
Toronto, Canada.

## Australian Representative

McGill's Agency  
179 and 218 Elizabeth St.  
Melbourne, Australia.

## Editorial & Advertising Office

45 West 45th St.  
New York City.



## Notice!

On and After April 4th  
the Address of

**MOTION PICTURE  
PROJECTIONIST**

*Will Be*

**7 West 44th Street  
New York City**

Please direct the attention of your Local Union Secretary to this new address

**7 West 44th Street  
New York City**

## The Next Great Era— WIDE FILM



Projection Room of the Roxy Theatre,  
New York City—equipped with B & L  
Super Cinephors

## PREPARE FOR IT WITH SUPER CINEPHOR Lens and Condenser System

With the new Super Cinephor lens and condenser system comes new projection efficiency for both wide and narrow width films. The Super Cinephor is the first anastigmat motion picture lens to be offered to the industry. Complete absence of astigmatism and distortion over the screen area has been accomplished.

Simultaneously with the Super Cinephor lens, a condensing system was developed to meet the problem of lighting the wide films and giving sufficient light for the perforated screen. This system is capable of delivering about 50% more light than previous systems.

The Super Cinephor Lens and Condenser System belongs in your theatre now. Write for complete details.

**BAUSCH & LOMB OPTICAL CO.**

680 St. Paul Street

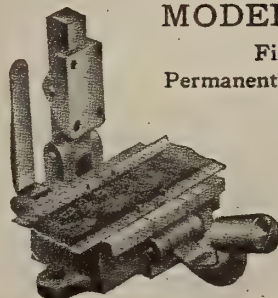
Rochester, N. Y.



# BAUSCH & LOMB

Makers of Orthogon Eyeglass Lenses for Better Vision

## Universal Film Splicing Machine



MODEL NO. 3

Pat. March 22:22

First-Class Results on New or Old Film

Permanent Gauge

No Adjusting

FOR THEATRES, EXCHANGES  
LABORATORIES, SCHOOLS

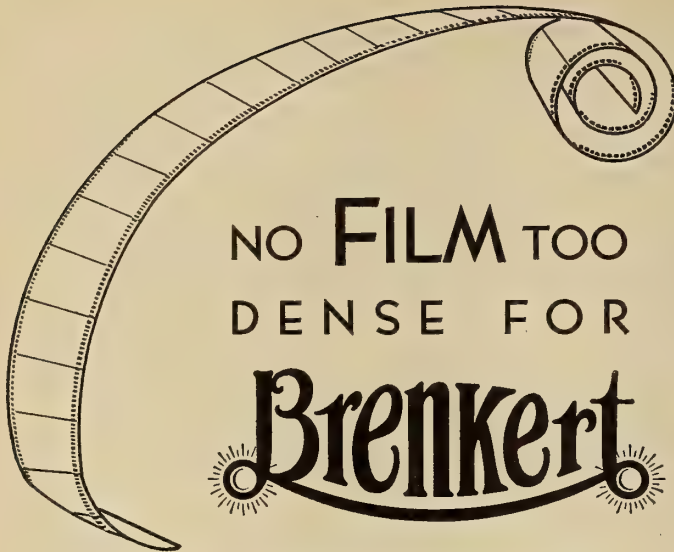
**Price \$6.00**

**GENERAL MACHINE CO., INC.**

816-826 East 140th St., NEW YORK, N. Y.

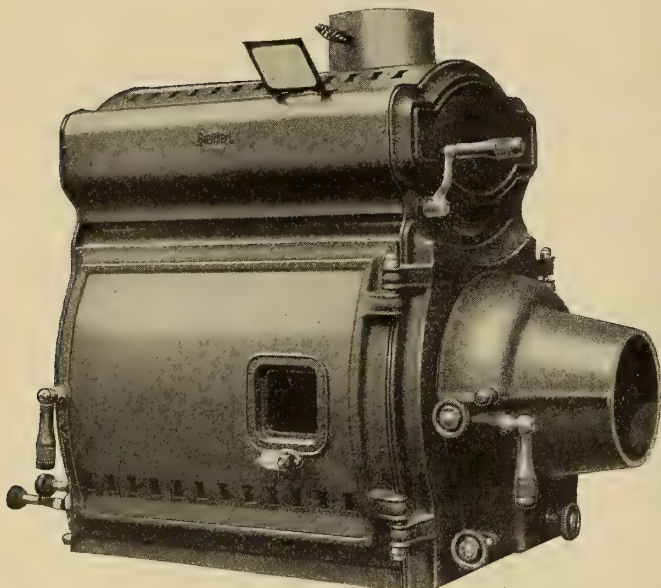
For sale by all Supply Dealers





NO FILM TOO  
DENSE FOR  
**Brenkert**

**SUPER HIGH INTENSITY  
PROJECTION LAMP**



Used in the Country's Finest Theatres

Write for literature and name of nearest dealer



CORRECT DESIGN—PRECISION CONSTRUCTION

**BRENKERT LIGHT PROJECTION CO.**

Engineers & Manufacturers

ST. AUBIN AT EAST GRAND BLVD., DETROIT

### Reverse Important Patent Case Decision

In a decision of far reaching importance in the motion picture industry the U. S. Circuit Court of Appeals for the Third Circuit has handed down a decision reversing the decision of the District Court, District of Delaware, last spring and upholding the contention of the Western Electric Company that its sound reproducing equipment does not infringe upon the Ries Patent No. 1,607,480.

Action was instituted originally in the District Court by General Talking Pictures Corporation and De Forest Phonofilms, Inc., against the Stanley Company of America for the use of the allegedly infringing equipment in theatres owned and operated by the Stanley Company. The defense of the case was assumed by the Western Electric Co., Inc., manufacturer, and Electrical Research Products, Inc., distributor of the equipment, respectively.

Infringements were alleged upon four patents. In the case of Patents 1,693,071, 1,466,701 and 1,695,414 the District Court ruled that there was no infringement by the Western Electric equipment and this ruling has been affirmed by the Court of Appeals. In the case of the Ries Patent, the District Court ruled there had been an infringement and it is this ruling that is reversed by the Court of Appeals.

### Equipment Exhibit at SMPE Meeting

One of the features of the Spring Meeting of the Society of Motion Picture Engineers to be held in Los Angeles will be an exhibit of new motion picture equipment developed within the last year, according to announcements by the Program Committee. The Board of Governors has also announced that the convention will be extended over a period of five days to permit ample time to visit studios and other points of interest.

The equipment exhibit will not be in the nature of a trade exhibit since there will be no booths for exhibits, although definite space will be allotted to each exhibitor.

## Notice!

On and after April 4th the new address of

**MOTION PICTURE  
PROJECTIONIST**

will be

**7 West 44th Street  
New York**

Please direct the attention of your Local  
Union Secretary to this new address:

**7 West 44th Street  
New York**



# WHY RUN YOUR THEATRE LIKE A STREET CAR?



Accurate Voltage Control is AUTOMATICALLY maintained when you have a

## TransVerteR

As long as you make your Projectionist a "Motorman"—constantly adjusting the voltage—the quality of his work is bound to suffer.

Fading . . . flickering . . . overloading creep in . . . and your Patronage slips away.

The Transverter, easily installed, will give you years of service, with less current . . . less repairs and practically no supervision.

WRITE US TODAY FOR DESCRIPTIVE LITERATURE

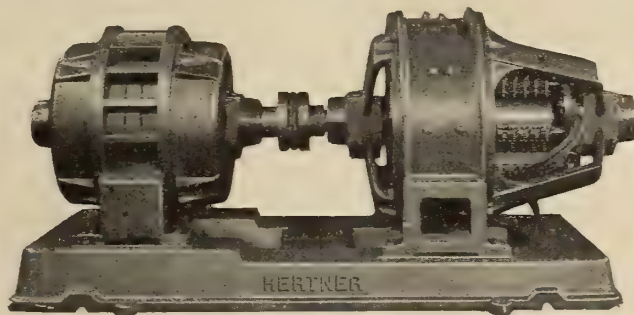
### Side Lights on the Transverter

There are more Transverters in use today than all other makes combined.

Think that over.

There is a reason and, if you show pictures, you

NEED  
the Transverter.



*The Transverter  
is manufactured  
exclusively by*

*Sold throughout the U. S. A.  
by The National Theatre  
Supply Company*

## THE HERTNER ELECTRIC COMPANY

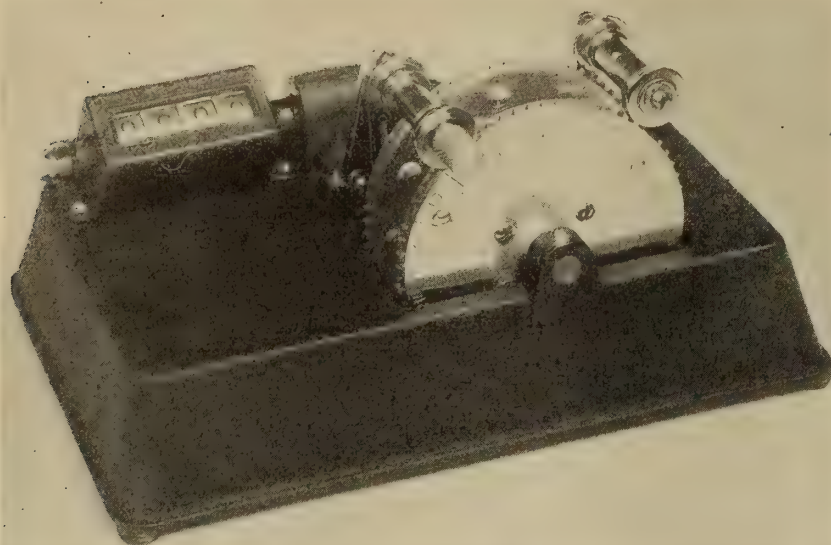
### TransVerteR

12688 ELMWOOD AVENUE

CLEVELAND, OHIO, U. S. A.



# ANNOUNCING...



The Companion  
Instrument to  
the Cue-meter.

The  
**T.E.S. PRECISION**  
Film Measuring  
Machine



## SPECIFICATIONS:

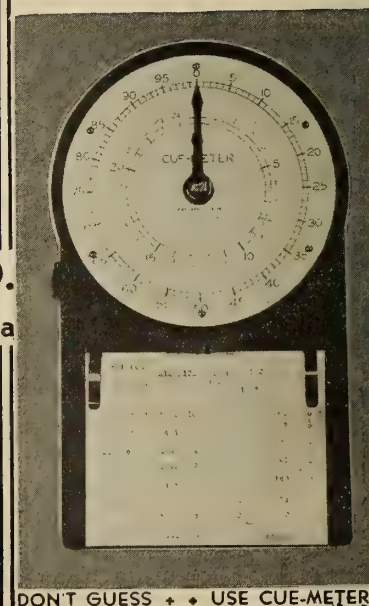
Heavy cast iron base---will not move around while measuring film . . Large 64-tooth sprocket--constructed of duralumin--direct connected to counter--no gears . . Sprocket supported on two bearings . . Frame numbers are engraved on edge of sprocket . . Counter placed at thirty degree angle--easy to read . . Base open under sprocket . . When placed over light on work bench allows frame lines to be easily distinguished without removing film from sprocket.  
and . .

with all of the above advantages the T.E.S. PRECISION Film Measuring Machine is priced at **\$35.00**

Manufactured by

**THEATRE ENGINEERING SERVICE CO.**  
1442 Beachwood Drive Hollywood, California

For sale by all branches of the  
**NATIONAL THEATRE SUPPLY CO.**



DON'T GUESS + • USE CUE-METERS



Better Projection Pays

THREE PROJECTORS

or

Emergency Equipment  
Kept in Al Condition  
Is a Sure Indication

of

Practical - Progressive  
Showmanship

*Genuine*

SIMPLEX PARTS

FOR

SIMPLEX PROJECTORS

*Give Most Satisfactory Results*

Send for Booklets Giving Full Particulars

*Simplex*

Rear Shutter Attachment

*Simplex*

Lens Aligning Device

*Simplex*

Lens Focusing Assembly

*Simplex*

Triple Lens Turrent

INTERNATIONAL PROJECTOR CORPORATION

90 GOLD STREET

NEW YORK





# GOOD NEWS FOR PROJECTIONISTS

Recent technical developments and major plant expansion now enable Technicolor to offer the motion picture industry an even finer quality of product which will appeal most forcefully to the keen sense of craftsmanship of the projectionist. Now, more than ever before, he can bring beauty and charm to his audience by means of the new Technicolor.

**Clearer Definition.** A basic improvement has been made by the development of a new Technicolor camera lens which gives pictures a notably sharper definition on the screen, and enables the man in the projection room to do as fine a job on Technicolor productions as on black and white pictures.

**Better Sound.** A special method of processing the sound track is still another development which gives Technicolor pictures an unusually fine sound reproduction.

**Motion Picture Audiences Like Color.** Data procured from hundreds of theatres which have featured Technicolor pictures establishes this fact beyond peradventure. Theatre managers are also enthusiastic for Technicolor, especially as exemplified in a recent hit such as "Whoopee."

# TECHNICOLOR



# Damping Methods for Electrical Reproducers

By D. G. BLATTNER

*Member of the Technical Staff, Bell Telephone Laboratories*

**I**N the usual types of electrical reproducers, such as those used with phonographs or sound pictures, the efficiency of the vibrating system is not constant but varies with frequency. These devices usually consist of one or more vibrating parts which may be linked together in a variety of ways, and the efficiency increases as resonance is approached so that a curve of response plotted against frequency shows one or more peaks, as indicated in Figure 1, instead of being a smooth line. Such variation in efficiency is undesirable in sound-reproducing devices, and is sometimes reduced by the addition of one or more dissipative, or resistance, elements.

The effect of a resistance used with one or more mass and stiffness elements is to reduce the efficiency over the entire frequency band due to the increased impedance to motion that it causes. The effect becomes much greater as resonance is approached, however, because in the neighborhood of the resonant frequency the resistance becomes the dominant component of the impedance and reduces the velocity to a greater extent than at other frequencies.

Because of this action, the result of adding a resistance element to a sound-reproducing system is to lower the efficiency slightly at all frequencies but to a very large extent at resonance, and thus to smooth out the efficiency curve.

## Various Forms of Damping

The effect of resistance elements on vibrating systems has long been known, and the element employed has assumed various forms. Occasionally, it has been represented by the dissipation in one or more of the vibrating elements, as when diaphragms or levers are made of paper or wood. The results of such damping methods

have usually not been altogether satisfactory because the dissipation obtained is too small in comparison with the mass and stiffness of the member.

In other systems a separate dissipative element has been employed which has no function other than that of providing damping. An illustration of this type is the rubber placed between the armature and the pole pieces of some types of reproducers for electrical phonographs. Such constructions are similar to the above type in that in providing damping the rubber adds appreciably to the mass and stiffness of the moving system, and where minimum values are desirable from the standpoints of tracking and of wear on the record, this form of resistance element like the other has not been entirely satisfactory.

It is possible, of course, to employ rubber with more satisfactory results, as is done in the Western Electric electro-mechanical recorder, used for making phonograph records. In this case a long rubber line is used as a torsional load on the vibrating system and the stiffness is not a controlling element. Unfortunately, however, this form of damping element is not readily adaptable to the electrical reproducer because of size, complexity, and cost.

## Liquids Utilized

Other forms of dissipative or resistance elements, used from time to time to equalize efficiency, have taken the form of fluids enclosed in suitable containers. The oil or air dashpot is a common form of this type of damping unit. Another scheme uses vanes moving in the damping liquid. In both of these types the damping depends upon the stirring of a fluid by a movable element, but the same result can be obtained by forcing the fluid through suitable shaped pas-

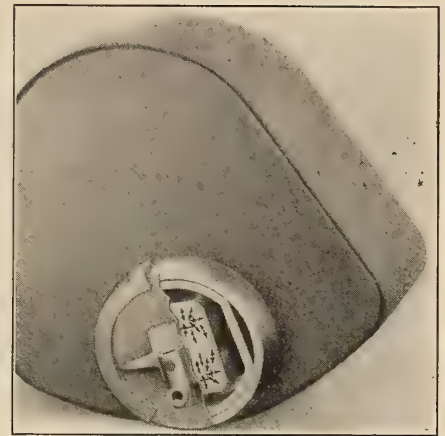


Fig. 2. Movement of the oil giving the damping effect in 4-A reproducer

sages, in which case the damping is produced by the friction of the fluid in contact with the stationary walls of the passages.

In many instances the latter type of damping element is the most satisfactory of those yet developed, and has been used by the Western Electric Co. in different devices for many years. One form of it is used in the electrostatic transmitter described by E. C. Wente in 1917. Here a suitably shaped cavity back of the diaphragm is filled with air and is so arranged that as the diaphragm vibrates to and fro, air is alternately forced in and out through holes in one wall of the cavity. The construction can be made small in size and gives good results in a transmitter where the amplitudes of the displacements are microscopic but it is not adaptable to the electric reproducer where displacements of several thousandths of an inch are often encountered.

Although Wente's work involved the use of air, other fluids might be used with similar results for larger amplitudes. Oils, for example, have been frequently used in the chamber instead of air.

## The 4-A Construction

One such construction is employed in the design of the No. 4-A reproducer used for the electro-mechanical pick-up for Western Electric sound-picture systems. Here the vibrating system has a diaphragm clamped at its periphery but free to rock about a diameter as a pivot. A plate is provided behind and parallel with the normal position of the diaphragm and the whole structure is filled with a

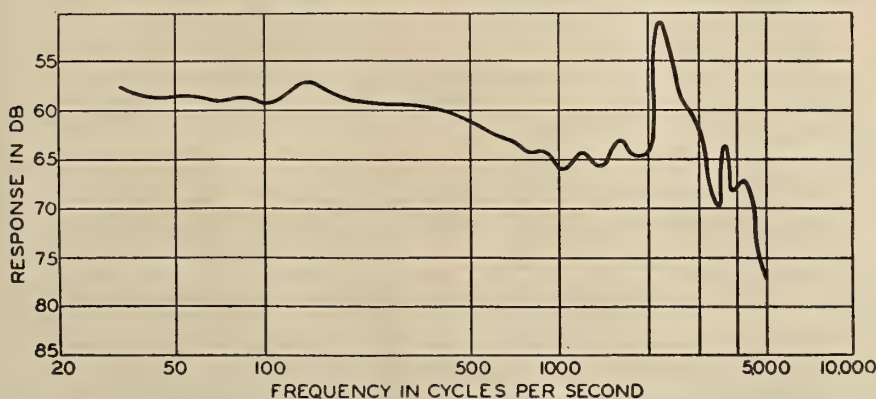


Fig. 1. Response characteristics of a No. 4-A reproducer without damping



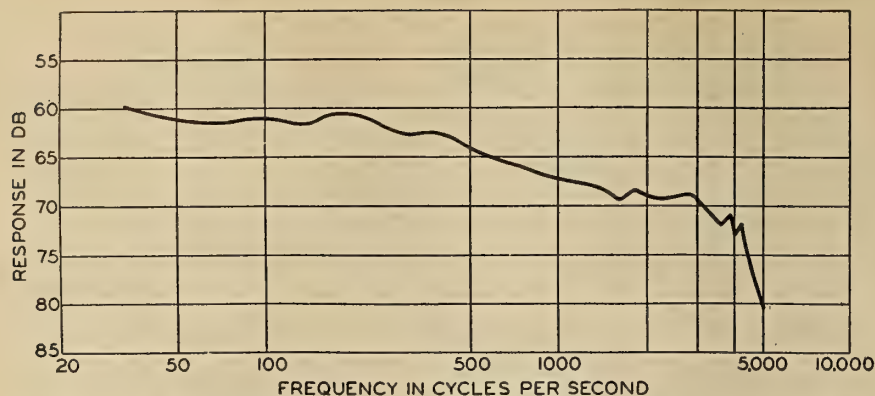


Fig. 4. With damping the peaks in the curve of the 4-A reproducer (Fig. 1), have been almost completely eliminated

rather viscous oil. As the diaphragm rocks back and forth under the influence of a driving needle, the oil between the plate and the diaphragm is swished about, tending to damp the motion. This construction is readily adaptable to the reproducer, mechanically, and is simple and inexpensive.

The damping system is indicated in Figure 2, and the complete reproducer is shown in Figure 3. The effectiveness of the damping arrangement is evident from a comparison of Figures 1 and 4. In the former case no damping was used and the resonant peak at a frequency of about 2300 cycles is quite evident. In the

latter case the damping was applied and the peak is almost completely eliminated.

The design of the No. 4-A reproducer, which was a pioneer in the field

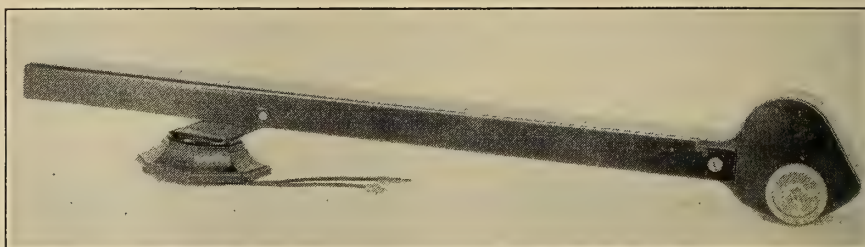


Fig. 3. Showing complete 4-A reproducer

## Elements of Magnetism and Electricity

By SIEGFRIED S. MEYERS†

THE subject of magnetism and electricity has grown to such enormous practical importance in recent years, that it has become necessary for scientists and engineers to treat with the subject in a series of consecutive articles. The layman can only arrive at an appreciation of this subject by tackling its contents with a challenging attitude, so that he may understand not only its practical application, but also the theory which governs it.

### Conductors and Insulators

Magnetism and electricity are so closely linked with each other that it is hardly possible to speak of one without the other. Fundamentally, they both obey the same laws, and practically, they both operate in harmony. For the sake of introduction it becomes necessary to think of electricity as some weightless fluid which is pushed from one place to another by some force. But, for a thing to travel from place to place, we must have reference to a particular medium in which it is traveling. We commonly refer to such medium as a *conductor of electricity*.

A conductor of electricity must necessarily be of such material as will allow the electricity to flow through it. If the material is of such a composition as will not permit the electricity to flow through it easily, we say that it offers resistance to the flow. Some materials offer little resistance, while others offer very high resistance. In fact, there are a great many materials which offer such high resistance that the current which can flow through them is negligible. Such materials are called *insulators*, because they insulate the electricity from some other material.

### Matter

It is a curious thing to see how two substances which look identical behave differently in many respects. Water and alcohol look alike, and yet each possesses different properties. If we placed sulphuric acid alongside of these we would notice no difference between them. Still, each gives a different taste and behaves differently when acting chemically. Similarly with solids: we know of many that look like one another and still do not possess the same properties. The explanation for the different properties of various states of

of oil-damped devices of its kind, involved a number of new problems—concerning particularly the characteristics of the oil. A definite viscosity is desired which should not vary to any great degree with either temperature or age. A substance like molasses, with a viscosity that varies greatly between summer and winter, would be very undesirable. Also the liquid must not jelly with age, as linseed oil does, and so require replacement after a moderate length of life, nor should it corrode the metal parts with which it comes in contact.

Since 1927 about 40,000 of the No. 4-A reproducers have been supplied by the Western Electric Company as standard equipment in their sound-picture and other reproducing systems. During this time practically no replacements due to aging or other operational defects have been made.

matter is purely theoretical, but a theory must be adhered to until it is either made a law or disproved by experimental evidence.

### The Electron Theory

Scientists have rubbed their heads in wonder for many years in the hope of expounding some theory which will explain why various materials behave differently. The electron theory has been stated in many ways, but the substance of it is merely that all matter is made up of minute indivisible particles which are called *molecules*. These molecules are units which are composed of *electrons* and *protons*, which have different arrangements for different substances.

To illustrate: a molecule of hydrogen is made up of an electron and a proton, the proton being surrounded by this electron which is revolving about it at an enormous rate of speed. Similarly for other gases like neon and helium, and solids like copper, silver, mercury and the like. Each substance differs from the next in its properties because of the configuration of the electrons and protons which constitute the atomic structure of the material in question.

Let us get an appreciation of these electrons and protons, so that we can apply them to electricity. It is com-

†Instructor of Physics, Stuyvesant High School, New York City.



**These 7645 theatres  
throughout the world  
that have installed  
Western Electric were  
guided in their choice  
by ERPI's famous  
"15 Points"—  
and have profited!**

\* If you have no copy of the  
"15 points," write for it today.

**Western Electric**  
**SOUND SYSTEM**

Northern Electric in Canada  
Distributed by

**Electrical Research Products Inc.**  
250 West 57th Street, New York, N. Y.

7645 W.E.

A

B

C

D

E

F

G

H

I

J

K

L

M

N

Chart based on survey of entire world theatre field.  
Letters A—N represent other makes of equipment.



mon practise to rub a piece of hard rubber on the fur of a cat and thereby produce a form of electricity. This electricity manifests itself in the form of an ability to lift small pieces of paper with the rubber. The rubber is said to be charged *electrostatically*.

Let us see what we mean by this. We know that this hard rubber, which is a form of matter, is made up of a fixed number of electrons and protons that are at peace with one another. Similarly, the molecules of the fur are at peace with one another. By mathematical computations, confirmed by experiments, it has been proven that the electrons within a body possess a negative charge, and are attracted to protons which possess positive charges. From this we conclude that opposite electrical charges attract one another; and similar charges avoid or repel one another. Therefore, when a piece of cat's fur, which is neutral (because it has a balanced amount of opposite charges), is rubbed with a piece of rubber which is neutral (for the same reason), some negative charges tend to leave the surface of the cat's fur to be attracted to some positive charges that are situated on the surface of the rubber.

As a result of this, the fur has a deficiency of electrons, or an abundance of protons, thereby making it positive rather than neutral; and the rubber has an abundance of electrons, making it negative, rather than neutral. When this negatively-charged rubber is brought into contact with a small piece of paper, which is neutral, the negative charge on the rubber tends to attract the positive charges on the paper and repel the negative charges on the paper. This behavior accounts for the paper being able to pick up the bits of paper.

Many of us have noticed that a hard rubber comb, which is passed briskly through the hair, tends to lift some hairs like a magnet lifts a nail. The explanation for this is based on the electron theory, in much the same way as was the example of cat's fur and rubber. A piece of glass when rubbed with silk can be made to behave similarly, except that in this case the glass becomes positively charged, and the silk becomes negatively charged. Hence, all electrostatic phenomena is explainable in terms of a flow of electrons from one place to another, these electrons having a strong affiliation for positive charges.

#### The Electric Current

All matter, being made up of electrons and protons, exhibit its properties on a basis of its *atomic structure*. In electricity we deal with conductors and insulators to a very large extent. By conductors we mean simply the ease with which such substances permit an electric current to

flow through them; and by insulators we have reference to their opposition to the flow of an electric current. Most metals are good conductors because of their simple atomic structure. They generally have an extra electron within their structure which they will readily surrender to the next atom of metal, provided some other atom gives it another electron to replace it. In a copper wire, for example, we should like to cause an electron at one end to knock off an electron from its neighbor to take its place. This electron is knocked out of its place with sufficient force for it to collide with the free electron of another atom, which is knocked free, to continue the process. As a result, we have a flow of electrons from one of the wires to the other. Such flow constitutes an *electric current*.

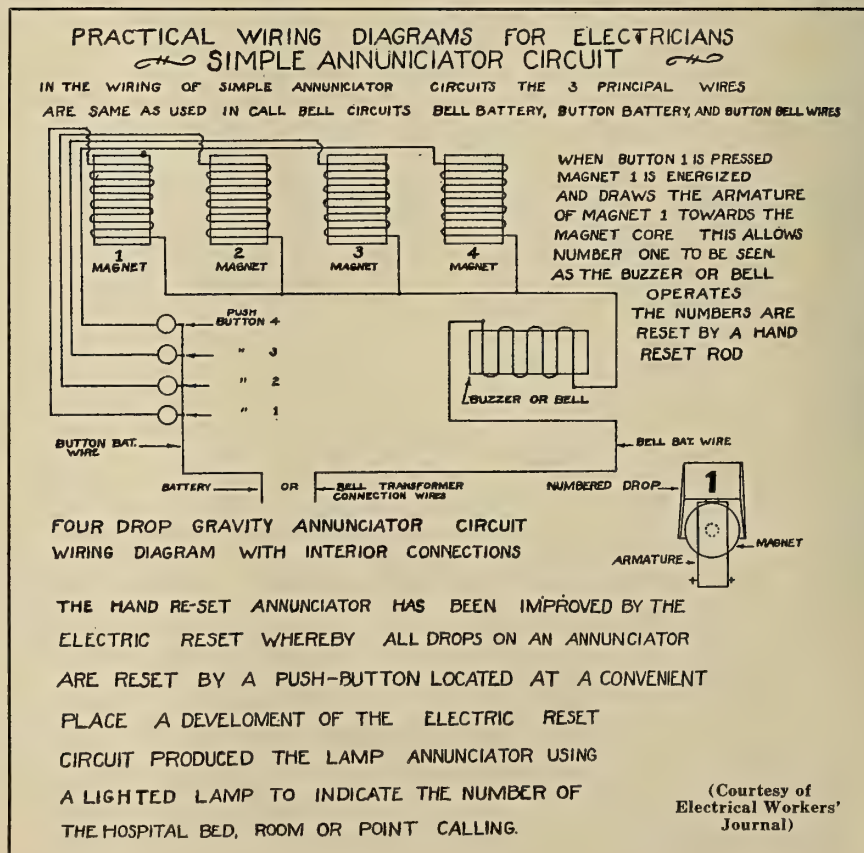
Regarding insulators, on the other hand, their atomic structures are such as to make them very unwilling to permit an outside force to knock off an electron. Such materials are said to be neutral and electrically inactive. Thus, any attempt to pass electrons from one place to another is met with opposition. Different materials resist the flow of these electrons in different ways. Hence, we have good insulators and poor insulators. There is no sharp line of demarcation between a very poor conductor and a very poor insulator. All materials are conductors to a certain extent, but for practical purposes those substances which are very poor conductors are classified as insulators, and vice versa.

In order to move anything from one place to another a certain force is necessary. A man pushing on a wheelbarrow exerts a force on the handles in such direction as will cause the wheels to roll over the ground which is offering frictional resistance. Water flowing down a mountainside does so at a certain rate of speed, depending upon the water pressure which is stored in the mountain lake, and upon the resistance of the stones along the way. Water flowing out of a pipe does so at a rate which is determined by the head or pressure at the source and the friction in the pipes.

#### The Electromotive Force

In electricity, an electric current constitutes a flow of a great number of electrons through a resisting material, under the influence of a motive force for these electrons. Such motive force is commonly called the *electromotive force*, because it is the motive power that forces these electrons through the resistance of the material in question. A common source of such force or pressure is obtained from a chemical battery, or from an electric generator. It has long been known that whenever a chemical reaction takes place a transfer of electrons takes place. On this basis the success of all chemical cells depends.

A simple cell may be easily made by immersing a piece of copper and a piece of zinc in dilute sulphuric acid and connecting to a small electric bulb. The bulb will light because chemical reaction causes electrons to flow from the substance having an abundance of electrons to that hav-





ing a deficiency. In the act of such transference the electrons pass their charge from one to the other along the wire, and ultimately pass through the low resistance of the bulb which is caused to light, because the electrons are flowing very rapidly in that part of the circuit. It is the electromotive force of the cell which drives a current through the resistance, in much the same way as the water pressure at the source forces a current of water through the resistance of the pipes.

This important fact was first explained by the physicist Ohm in the form of a proportion. Ohm concluded, after many experiments, that the current which flowed in any conductor depended primarily upon the electrical pressure which urged it. Alessandro Graf Volta discovered the first practical cell which would supply this electromotive force, and since his time all electrical pressures are explained in terms of *volts*. Marie Ampère, another careful experimenter, gave a definite value to the current or rate of flow, which he based on the results of many carefully worked out experiments. As a result of his work, the *ampere* has been recognized as the standard for the electric current, or rate of flow.

It took the mind of a scientist like Ohm to see the relationship between the rate of flow and the pressure which pushed the current. He noticed that the rate of flow of the current was directly proportional to the electromotive force which drove it. In other words, the current is directly proportional to the voltage. Since the resistance to the flow of current in any given circuit remains constant, Ohm concluded that the voltage was equal to the current multiplied by the resistance offered to the flow of current. Briefly, this means that a volt is the electromotive force necessary to drive a current of one ampere through a resistance of one ohm. The following formula represents the mathematical equation of Ohm's law:

*Formula:* Volts are proportional to Amperes

$$1) \text{ Volts} = \text{Amperes} \times \text{Ohms}$$

$$\text{or: } 2) \text{ Amperes} = \frac{\text{Volts}}{\text{Ohms}}$$

$$\text{or: } 3) \text{ Ohms} = \frac{\text{Volts}}{\text{Amperes}}$$

#### Application of Ohm's Law

Let us now see how we can use Ohm's Law in solving a simple problem. Suppose it were necessary for us to determine how much voltage is necessary to drive a current of two amperes through a fixed resistance of fifty-five ohms.

$$\begin{aligned} \text{Solution: Volts} &= \text{amperes} \times \text{ohms} \\ \text{volts} &= 2 \times 55 \\ \text{volts} &= 110, \text{ Answer} \end{aligned}$$

Therefore, we must connect our cir-

cuit to a direct source of current which has a pressure of this value, so that it may drive this 2-ampere current through a resistance of 55 ohms. It would not make one particle of difference if this 55-ohm resistance were made of five resistances of 11 ohms each, joined by wires. The same pressure is pushing the same current through the same opposition much in the same manner as a pressure of water forces the fluid through a series of five pipes which offer equal resistances.

Suppose we used an instrument like a voltmeter, which measures volts in a given circuit, and found that it read six volts when connected to the terminals of a battery. With an instrument called the ammeter, we measure a flow of current equal to three amperes in the circuit which is connected to the resistance. Since we know the electromotive force which is driving the known current, we can calculate the resistance offered to this flow of current by using formula number three:

$$\begin{aligned} \text{Formula: Resistance} &= \frac{\text{volts}}{\text{amperes}} \\ \text{Resistance} &= \frac{6}{3} = 2 \text{ ohms, Answer} \end{aligned}$$

Similarly, we can calculate the current that is necessary to pass through a given resistance, under the pressure of a given electromotive force. For example, how much current will flow in a circuit which has four resistances of ten ohms each connected in line with one another to the electric

circuit which has an electromotive force of 120 volts?

*Solution:*

$$\begin{aligned} \text{Amperes} &= \frac{\text{volts}}{\text{ohms}} \\ \text{Amperes} &= \frac{120}{40} \\ \text{Amperes} &= 3, \text{ Answer} \end{aligned}$$

The reason why all the resistances are added to one another is because the same current is forced through one as through the other. This is said to be a *series circuit*, which is one having the same current flows through each portion with the same intensity.

#### Value to the Projectionist

The projectionist will find the application of Ohm's law very valuable in all his work. Anything that deals with electricity necessarily involves the use of currents, voltages and resistances. It is important to understand what happens in these resistances, so that we can see how these, as conductors, differ from other materials which are insulators. Hence, with the aid of the electron theory, we are able to select a starting point in an electrical circuit, and can progress step by step analyzing the behavior of this current in any portion of the electrical circuit. We have seen thus far only the most elementary case of an electrical circuit, but without it we could not progress further until it is thoroughly understood. Subsequently, we shall deal with more complex circuits, but we shall see that even these circuits are very simple, when they are taken apart and handled as groups of separate problems, to be reunited when we have arrived at their respective solutions.

## 'Magnalcolor' A New Color Film

A NEW natural color film, to be known as Magnalcolor, has just been announced by Consolidated Film Industries of New York and Hollywood. This film, the result of long experiment, is based on the bi-pack method. The bi-pack method makes use of two negatives running emulsion to emulsion. The front negative (nearest the lens), consists of film carrying emulsion which is sensitive to blue rays. A coating of special red dye is placed on top of the gelatine emulsion of this film. The back film consists of a highly panchromatic negative, sensitive mainly to red rays. When these two films are at the aperture, emulsion to emulsion, the light passes through the back of the first negative (blue sensitive); this gives the blue image. The light then strikes the coating of red dye which absorbs the blue rays and allows the red rays to pass through to the second negative, thus

giving an image of the red portions of the subject.

Among the advantages of Magnalcolor cited by Consolidated are: a sharpness equal to the best obtainable with black and white, natural and pleasing color that can be held absolutely uniform in quantity production, and the ability to obtain with Magnalcolor equally good results with no change other than a slight adjustment of the camera gate. The following statement by Consolidated describes this new product in detail:

"The Magnalcolor process is founded on an extremely comprehensive set of patents for which Consolidated Film Industries has an exclusive license. These patents include methods of assuring exact registration in printing, the application of the colors in processing the positive film with many modifications of methods for this; basic patents relating to the use of positive film for color work, and num-



erous auxiliary patents for the production of the process. In addition to these patents which so amply protect the user of color film, Consolidated Film Industries, Inc., are the owners of many patents covering developing and printing machinery and other apparatus widely used in film processing.

"The greatest difficulty in color production has always been the lack of photographic and mechanical knowledge as applied in the processing of black and white negatives and prints which are the very foundation of successful color processing. Because it has such knowledge, the Consolidated was able in a very short time to perfect the bi-pack method to a state where commercial release prints can be done with the same precision as black and white release printing in the most economical manner possible.

"It is obvious that in using two negatives, each of which contains a partial record of the colors photographed, there must be a correct balance establishing the latent color values of these negatives when they are developed, and later when they are printed and colored on positive stock. The final results are doomed to failure unless the laboratory doing the processing has had knowledge of all its major and minor difficulties including the balancing of negatives and positives. It is this knowledge of the balance of values in black and white film, backed by years of experience and organized training for such work which has made it possible

for Consolidated to produce this new color film.

"Not only is this technical knowledge of film processing essential to successful color production, but it is just as necessary that the producers of color film have a complete mastery of laboratory machinery. Consolidated has the advantage of fifteen years' experience in this field. These fifteen years represent an accumulation of technical knowledge gathered by the welding together of the most representative laboratories in the country into one large, single organization. Such a combination of units into one organization has resulted in a vast body of technical knowledge executed and administered by experts. All of these factors combined to give Magnacolor its outstanding superiority.

"Consolidated is prepared to offer cooperative service to any cameraman or producing organization which desires to learn more about the technique of color photography and to apply it in their pictures. Consolidated believes that there is a great future for color films not only in theatrical motion pictures but also in industrial and educational pictures—two fields the possibilities of which have not yet been developed.

"In addition to the regular laboratory service on Magnacolor, Consolidated will have a staff of trained cameramen with full equipment ready to do photographic work for such clients who have no equipment of their own.

inferred from the experimental data in various articles published that an optimum value of screen brightness about eight years ago was 10 foot-candles.

"During the past year the Academy of Motion Picture Arts and Sciences has had a committee in operation called the Screen Illumination Committee, whose purpose it was to study screen brightness. The Society of Motion Picture Engineers for years had had a Theatre Lighting Committee, part of whose work was a study of the screen brightness subject.

"There are occasions arising where a picture shown in two different projecting rooms, or theatres, will look quite different on the screen. Reference is made particularly to the same print. Oftentimes as a result of the difference, blame is placed on the projectionist or on the laboratory for their print quality. In most instances the cause of this difficulty can be centered in the inequality of the brightness of the screens on which the picture is viewed.

"This general problem of screen brightness is of great magnitude and extends from the processing laboratory through the studio projection rooms to the screens of the multitude of theatres throughout the country. It is naturally quite impossible at this time to make a standard condition which would please all parties concerned but it does seem that at least within a given studio the various projection rooms could be maintained at some definite screen brightness. Furthermore, in making a study of various theatres and studios relative to their screen brightness the values are not greatly in disagreement but they are sufficiently so to make standardization impossible. Theatres agree among themselves fairly well, but the studios are not as good in this respect.

"The purpose of this article is simply to bring to the attention of those interested a tabulation of some of the data available at the present moment, which data was accumulated during the past year. The accompanying table gives rather completely such data."

## Progress of Screen Illumination Survey

AMONG the more important problems of theatre reproduction is that of screen brightness, a subject about which there is available a plenitude of conversation but very little data on which to base recommendations for standard practice. Recently the Academy of Motion Picture Arts and Sciences appointed a Screen Illumination and Print Density Committee which has made an intensive study of the subject and which will soon issue a comprehensive report

covering its activity. The following contribution on the subject by Emery Huse appeared in a recent issue of *American Cinematographer*:

"The question of screen brightness has arisen on many occasions but there seems to be very little definite data available as to what brightness should be maintained on motion picture screens. A review of the literature failed to show any definite recommendations of specific brightness values for motion picture films but it may be

THEATRE	TYPE	LENGTH OF THROW	TYPE OF SCREEN	SIZE OF SCREEN	SCREEN ILLUMINATION FOOT-CANDLES
A	Neighborhood	100 ft.	Transvox	13' 2" x 17' 8"	8.5 f. c.
B	"	99 ft.	"	13' 2" x 17' 8"	10 f. c.
C	L. A. Class A House	100 ft.	Datone X	14' 3" x 19'	10.5 f. c.
D	Hollywood Class A	95 ft.	Transvox	18' 6" x 24' 7"	11 f. c.
E	Hollywood Class A	75 ft.	"	14' 6" x 19' 4"	12 f. c.
F	Neighborhood	125 ft.	"	13' x 17' 5"	9 f. c.
G	Laboratory	65 ft.	Datone X	Exact dimension unknown	12 f. c.
H	"	35 ft.	Not sound screen	" " "	24 f. c.
I	"	45 ft.	Datone X	10 x 12	17 f. c.
J	"	35 ft.	Not sound screen matte surface	7 x 9½	38 f. c.



# Test Set for Sound Projection Equipment

By A. H. WOLFERZ†

**S**INCE the motion picture theater is the main outlet for the products of the motion pictures industries, it seems that anything reasonable which will keep the show running and, which is quite as important, keep it producing satisfactory results, is worth considering. Equipment of all kinds requires periodic attention, adjustments, and occasional replacement of parts.

In order to facilitate this work, a portable test set for assisting in the servicing of sound-picture equipment is hereby suggested. As with practically all kinds of apparatus a compromise must be made between the desired and the attainable. So, with this test set, if we were to design it for all the tests possible, portability would be sacrificed and it would become useless for field work. It has been designed, therefore, to perform only the essential and necessary tests.

Since the heart of the reproducing system is the amplifier tube, suitable testing facilities are provided so that in the event of trouble these tubes may be tested both in conjunction with the amplifier equipment and independently of it. The use of apparatus for measuring the characteristics of amplifier tubes, because of its bulk and weight, is restricted to laboratories and service stations. However, a simple, rapid test is quite essential at the time of installation and at regular intervals thereafter, as a matter of routine inspection. The amplifier tubes most commonly used in amplifier installations are the types 112-A, 245, 210, 250, 171-A, 227, 226, 845, 239, 205, 211, 280, and 281, the last two being rectifier tubes.

## Procedure for Testing

The commercial 60-cycle alternating current supplied by the lighting mains is used. The filament or heater of the tube being tested is connected to the secondary of a transformer having a variable primary, so that its turn-ratio may be altered to compensate for variations in the line voltage. An a-c voltmeter is connected across the filament or heater so as to indicate when the correct value is obtained.

The plate circuit voltage is approximately 120 volts and the grid is connected to one side of the filament or heater, providing a bias such that approximately the rated plate current is obtained. The grid potential is made less negative, causing the plate current to increase when a good tube is

being tested. When the tubes are old or defective the change of plate current becomes very small or is not noticed at all. When making this test the rated values of plate and grid potentials are not applied to the tube. It is, however, a useful test when trouble exists which causes the equipment to be incapable of producing proper operating voltages.

When the amplifier equipment is capable of supplying to the tubes the normal filament, grid, and plate voltages, the tubes may be tested under operating conditions. The tube to be tested is removed from the socket on the amplifier panel and inserted into a socket provided on the test set. The test set is provided with a cable terminated by a plug which is inserted into the socket on the amplifier panel. When this connection is made, the value of the plate current is indicated by the plate milliammeter of the test set. On pressing a switch the grid is made less negative, causing an increase of plate current.

After testing a number of good tubes under these conditions, an average value of increase can be determined. As with the previous test, a slight increase or no increase of plate current indicates that the tube is below normal or is unfit for further use.

## A Third Test Method

A third method of testing tubes may be provided which also employs the filament, grid, and plate potentials as they exist at the amplifier panel, but, instead of obtaining two values of plate current for a change of grid potential, the circuit is so arranged that the plate current remains constant.

The tube is inserted into the socket provided on the test set, the latter being connected by cable and plug to the socket on the amplifier panel. The plate current corresponding to normal plate, grid, and filament voltages is noted. A switch is pressed which introduces a resistor into the plate circuit and then reduces the grid potential to zero. This resistance, connected into the plate circuit, is so proportioned that when a normal tube is tested no change of plate current is observed. The magnitude of the change is a measure of the inferiority of the tube.

The values of filament or heater voltage, grid voltage, plate voltage, plate current, and cathode voltage, measured at the sockets of the tubes on the amplifier panel, all serve to check the remainder of the equipment. For example, should the heater voltage be too high or too low this could be caused by improper adjust-

ment for line voltage. A lack of heater voltage may indicate an open transformer or lead wire. Improper plate voltage may be caused by a defective rectifier tube, a defective high potential transformer, faulty condensers, etc. Improper plate current may indicate an improper grid potential. Improper grid voltage may be caused by a defect in the resistance used to obtain this potential or by a defective grid battery.

When making these tests it is only necessary to remove each amplifier or rectifier tube in turn and place it into the socket provided on the test set; the test set is then connected by means of the cord and plug, to the socket on the amplifier panel. The instruments on the test set have suitable ranges for properly measuring the various currents and voltages, and suitable switches for connecting these instruments, with their respective ranges, into circuit. All instruments used on the test set have bakelite cases or are otherwise insulated to protect the operators. The voltmeter used to measure the filament, grid, plate, and cathode voltages is of the permanent-magnet, movable-coil type, and requires less than one milliamperes for full-scale deflection. Its readings may be relied upon to within one per cent of the full-scale value, and will indicate voltages from about 1 to 1500 volts.

## Range of Set

The milliammeter of the test set used for measuring plate current is also of the permanent-magnet, movable-coil type, and has the same scale-length and accuracy as the voltmeter, with ranges suitable for carrying out the tests. Ranges up to 300 ma. should prove satisfactory. A desirable feature is the range-changing switch, having a spring control which leaves the milliammeter always set for its highest range, preventing possible damage when defective tubes or circuits are encountered.

The voltmeter provided to measure the heater voltage of a-c tubes, a-c lines voltage, or transformer secondary voltage, is of the movable-iron type, with a scale-length and accuracy such that reading are correct to within two per cent of the full-scale value. Errors due to temperature changes, etc., are within this value and provision is made for preventing the series resistors from overheating and altering the voltages which it is desired to measure. That such qualifications are quite important may be realized when it is considered that voltages from approximately 1 volt to 3,000 volts are encountered and suitable

†S. M. P. E. Trans., Vol. XVI, No. 3, March, 1931.

†Weston Elec. Instrument Corp., Newark, N. J.



ranges and switches are necessary in order to carry out these measurements.

The d-c voltmeter is also designed so that it may be used to measure resistances of circuits or parts of the apparatus, or to test for continuity of the wiring of circuits. The type of resistances encountered require that it be capable of giving an accuracy of about two per cent for resistances from about 10 to 100,000 ohms. A small battery is self-contained in the case, connected so that its voltage changes may be compensated for. It is easily removable for replacement and is of a standard size readily purchased.

It is very desirable to have a means for measuring the a-c output voltage at various places in the amplifier system or across the voice-coil of the speakers. This requires an a-c voltmeter with a number of ranges, consuming a small amount of power and having a fixed value of impedance; a value of 4,000 ohms is generally used. A very convenient method is to use a permanent-magnet, movable-coil instrument in conjunction with a rectifier. Copper-oxide rectifiers are used, giving very satisfactory results for this type of test work.

If this meter is used in conjunction with a test record or film having an assortment of frequencies, a very convenient and useful test may be made of the complete installation, which should also prove of value in determining the relation of modulation to ground noise. The scale may be calibrated in terms of effective values or a curve can be employed to allow the use of the d-c scale already on the meter.

#### Measuring Capacitance

Numerous condensers are employed in the amplifier circuits, and the test set is also designed to measure capacitance to a fair degree of accuracy. This is accomplished by using a low-voltage range of the a-c voltmeter, in series with a suitable resistance and the condenser to be measured, connected to a source of alternating current of known frequency and voltage. The voltmeter then simply acts as a milliammeter and indicates the current flowing in the circuit. Marks are provided on the scale of the instrument by previous calibration with reference to known condensers connected in series with a 60-cycle, 115-volt supply. Marks corresponding to 1, 2, 4, and 8 microfarads are provided on the scale, and a curve plotted from these can be used where more accurate readings are desired. The adjustable series resistance affords a means of compensating for line voltages higher or lower than 115 volts. The adjustment is made by first closing the circuit where the condenser is to be inserted, and then adjusting the

resistor until full-scale deflection of the instrument is obtained.

Fig. 1 shows the arrangement of a set provided with means for making the tests and measurements outlined above.

Beginning at the upper-left of the panel, there will be found a fuse connected in the filament circuit; along the upper part of the panel will be found sockets for the various tubes mentioned. There are shown, from left to right, a socket of 211, 845 or similar tubes, a UX socket for all 5-prong heater tubes similar to the 227, a socket for W. E. 205 tubes, and last the UX socket for all standard 4-prong tubes as the 112, 171-A, 245, 210, 250, 226, 239, 280, and 281.

#### Details of Complete Set

The instrument on the left is the milliammeter for plate-current measurements; its ranges are selected by the switch directly below the right-hand instrument, providing for ranges of 3, 75, 150, 300 ma. Regardless of the setting of any switch, this milliammeter with its shunts is always connected in the plate circuit. Its ranges are also available for other measurements by using the binding posts marked "Milliamperes D.C.", at the lower right-hand corner.

The instrument in the center is the combination a-c voltmeter, milliammeter, and ammeter. It is a movable iron type of instrument and will also indicate when direct current is used. However, more current is required to operate it than is required for the d-c voltmeter, so that it could not, therefore, be used as a substitute for the latter. A two-winding, two-circuit field coil is used, allowing for ranges of 4, 8, and 16 volts requiring a current of exactly 100 ma. for full-scale deflection, and all errors are kept small enough to provide an accuracy of two per cent of the full-scale value. Ranges of 150, 300, 750, 1,500, and 3,000 volts, requiring exactly 20 ma. for full-scale deflection, are provided. The low ranges are for use in meas-

uring filament or heater voltage, and are available for use with the plug and cable or at the binding posts. The higher ranges are for line voltage and transformer secondary voltage. These measurements can be made only at the binding posts at the left-hand edge of the test set. An additional winding is provided for ranges of 4 and 8 amperes, which may be used for measuring line currents. Marks are drawn on the scale corresponding to 1, 2, 4, and 8 microfarads, using 115 volts, 60 cycles; the rheostat at the lower left provides the compensation for line voltage.

#### The Volt-Milliammeter

The instrument at the right is the volt-milliammeter. This is also a permanent-magnet, movable-coil instrument, and is principally used to measure filament, grid, cathode and plate voltages when the test set is connected to the amplifier panel by the cord and plug. Its ranges of 3, 7.5, 15, 30, 75, 150, 300, 750, and 1,500 volts and the connections for making these measurements are brought into circuit by the double-pole multiple switch shown directly beneath the a-c voltmeter. A shunt is provided in the grid circuit so that this meter may be used to measure one of the plate currents when full wave rectifier tubes are tested. All the ranges are available at the binding posts shown at the right edge of the test set. A circuit is also provided for measuring resistance, including a self-contained 3-cell battery, a variable resistance shown below and to the right, and the binding posts marked "Resistance Test." It is first necessary to short circuit the binding posts marked "Resistance Test" in order to first adjust the variable resistance for full-scale deflection of the meter.

The short circuit is then replaced by the unknown resistance to be measured. A scale is provided having ranges of 0 to 10,000 and 0 to 100,000 ohms, permitting values of resistance to be read directly.

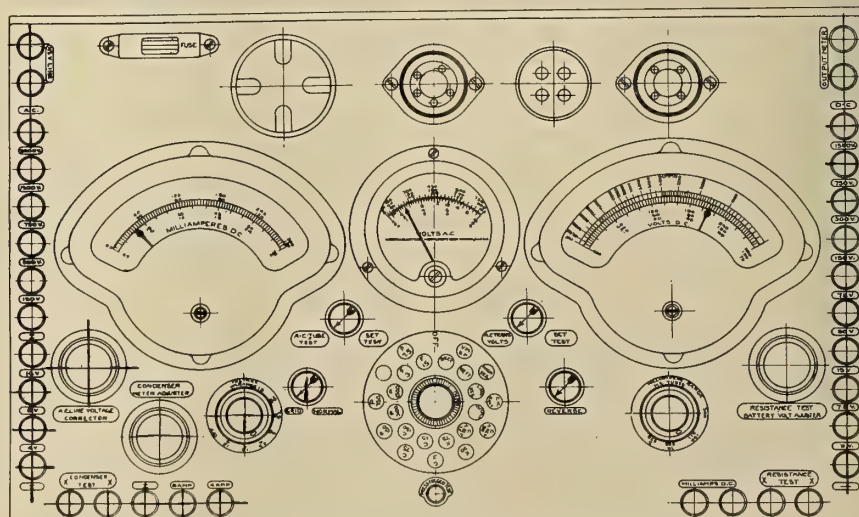


Fig. 1. Top view of servicing test set



The two-pole, multiple switch is provided with a position to allow this instrument to be used with a copper-oxide rectifier for measurements of output voltage. Suggested ranges would be 3, 30, and 150 volts, each with an impedance of 4,000 ohms. The other switches on the panel are to bring about the tests and measurements previously referred to, such as changing the grid potential, measur-

ing transformer secondary voltage, and reversal of the d-c voltmeter.

The test set may be used for other tests about the theater such as line voltage measurements, measuring resistance of circuits, tracing for open or short circuits, loud speaker voltage or currents, fuse testing, battery voltage tests, and many other tests which will present themselves with experience.

## New Simplex Triple Lens Turret

**A**NNOUNCEMENT has been made by International Projector Corp. of a new triple lens turret for all regular and Super Simplex projector models. This turret may easily and quickly be assembled to any Simplex mechanism, and its use will eliminate many projection problems effecting lens changes. Each of the three lens mounts may be separately adjusted both vertically and laterally and each may be separately focused; also, these lens mounts accommodate all makes and focal lengths of lenses either half or quarter size. It is only necessary to insert, adjust and focus three lenses of the desired focal lengths after which any one of the three may be instantly swung onto the optical axis.

One lens of the proper focal length may be used for silent or sound-on-disk prints, the second for sound-on-film, and the third for Magnascope or other types of effects. Where sound-on-disk is not in use, one of the lens mounts may be equipped for Magnascope, and another for some other particular effect, while the third remains for sound-on-film projection. It is obvious that any number of combinations of lenses may be used for different purposes and it becomes un-

necessary to slip lenses in or out of the mounts during an entire performance.

The turret proper is mounted in a substantial frame on four 90-degree V-grooved rollers with provision for taking up all end and radial play in rollers, thereby providing a free-turning turret which is rigidly supported and free from shake and vibration. Positive audible stops have been provided for each projection position by means of index pins and a tapered lock so that normally but one lens at a time may be swung into position.

This operation is accomplished by pulling forward on lever A, Fig. 3, and revolving the turret 120 degrees. When it becomes necessary to pass one lens, this may be accomplished by slight pressure on lever B, Fig. 3. The turret lock is automatically released when pressure is placed upon lever A, Fig. 3, and the tapered lock C, Fig. 4, automatically snaps into engagement when the turret has arrived at its new position.

In the design of this unit none of the fire prevention devices has been removed from the mechanism and the fireproof properties of the projector have, therefore, in no way been impaired.

### Protective Features Retained

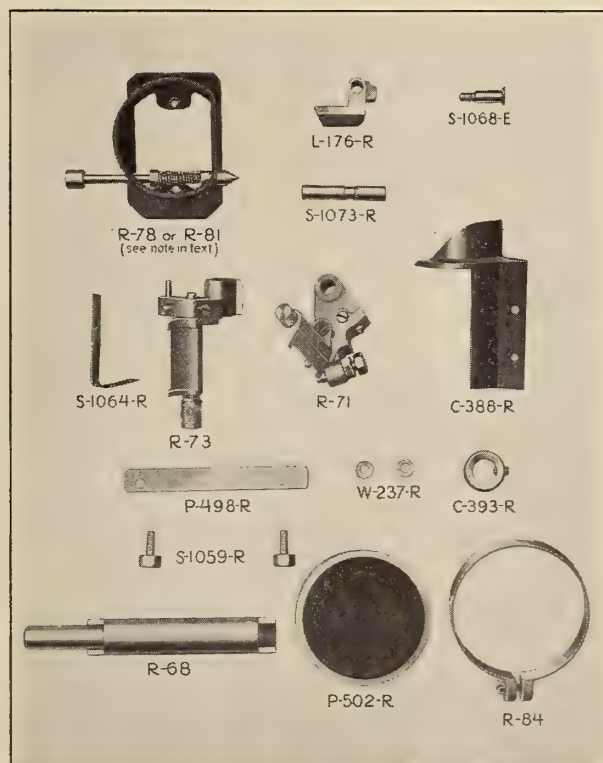
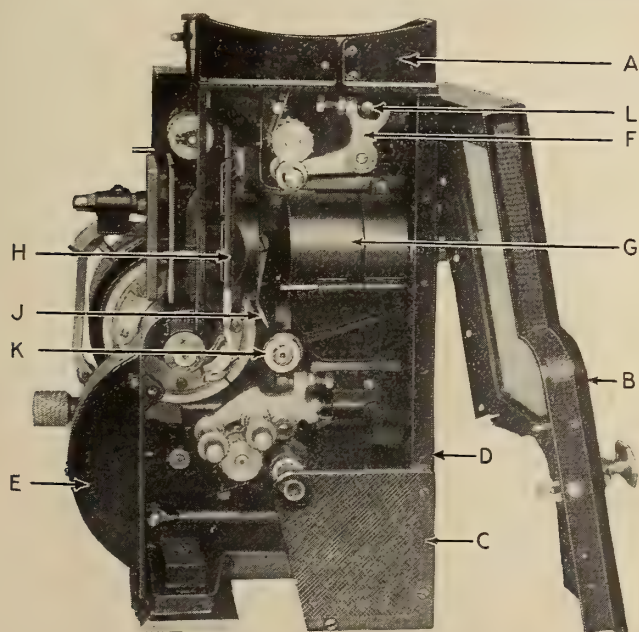
With the turret a new film protector and gate latch assembly are furnished, the use of which eliminates the necessity for the projectionist to place his hand within the mechanism when closing the gate while threading. The new lever release comes through the film protector and is very handily located, as shown in Fig. 4. A slight pressure on the release button D, Fig. 4, immediately closes the gate. A mirror arrangement is also provided on the rear of each lens chamber by means of which the aperture may be observed for checking up on framing after film is threaded in place.

Great care has been exercised in the design of this assembly that no difficulty may be experienced in attaching it to the mechanism, and it is not necessary to cut away any part of the mechanism whatsoever. If at any time the wrong lens in the turret should be in front of the aperture, the correct one may be swung into operation in a fraction of a second with hardly any perceptible effect upon the screen.

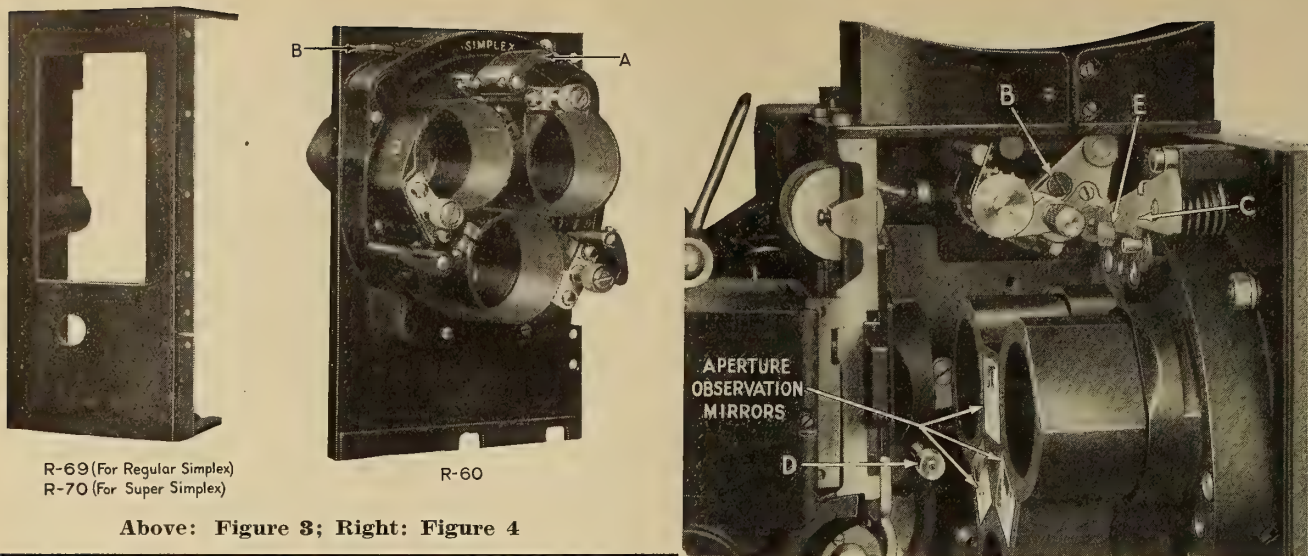
As above stated, all half-size lenses of standard dimensions may be readily inserted and clamped by the entire inside diameter of the mount. Where quarter size lenses are used it is necessary for us to supply quarter size adapters. Of course, it is impossible for dealers to know what types of lenses are being used in any par-

Left: Fig. 1

Right: Fig. 2







Above: Figure 3; Right: Figure 4

ticular theatre, but if this information is given at the time orders are placed, dealers will furnish at no additional charge the proper adapters to accommodate them.

#### Regular Simplex Attachment

Following are instructions for the attachment of this triple lens turret to regular Simplex mechanisms. Directions for attachment of the turret to Super Simplex models may be had at any supply dealer.

*Tools required for attachment: large and small screw drivers, and small wrench for 13/32" hexagon nut.*

Remove from mechanism in order given the following parts shown in Fig. 1: magazine roller holder A, right door B, right cover C, right front cover D, right back cover E, upper pad roller arm F, lens holder complete G, film gate H, film trap door lever J, intermediate shaft collar K and (on mechanisms below serial No. 9351 only), pad roller arm spring. Lay these parts to one side so as not to confuse them with parts shipped with turret.

The next operation depends on the serial number of the projector to which the turret is being attached. In Fig. 2 will be seen two types of pad shoe arms, one of which, R-73, requires a new spring S-1064-R as shown. This pad shoe arm and spring are to replace the old pad roller arm on all Simplex mechanisms up to and including serial No. 9350. The other pad shoe arm shown, R-71, is to replace the pad roller arm removed from all mechanisms subsequent to and including serial No. 9351, either Regular or Super Models.

On mechanisms prior to No. 9351, replace pad roller arm spring removed with new spring S-1064-R, Fig. 2, furnished, using screws originally removed. Then attach R-73 complete to mechanism, using for this purpose pivot screw originally removed. Bend pad roller arm spring if necessary to adjust tension. Loosen pad shoe ad-

justing screw B, Fig. 4. Place a double thickness of film on upper sprocket and by means of new pad shoe arm stop screw adjust shoe so that it just touches the double thickness of film; then tighten pad shoe adjusting screw B, Fig. 4, and lock nut on pad shoe adjusting screw.

On mechanisms subsequent to No. 9350 remove old upper pad roller arm stop stud L, Fig. 1, by loosening screw which holds it in place. Next insert new pivot stud S-1073-R, Fig. 2, in its place, clamping with the same set screw. This stud S-1073-R now becomes the pivot stud and the old pivot stud becomes the stop stud for the new pad shoe arm.

Attach new pad shoe arm complete, R-71, Fig. 2, by slipping over new pivot stud S-1073-R already inserted, as shown in Fig. 4, and attach to old pad roller stud (now the stop stud), the washer and screw originally removed, to retain arm in place.

#### Publish, Not Patent Ideas

Out of the welter of patent contests and patent litigation in radio has come one interesting patent policy on the part of a company which maintains an important research department that is continuously making inventions and improvements.

The executives of this company frankly declare that they are *not interested* in patents. They do *not* take out patents. Instead, they have found that the best way to avoid patent difficulties is to *publish*, as soon as possible, whatever their laboratory develops. As soon as publication is effected, of course, no one else can patent the device. Everyone is then free to use it, but the company producing the invention already has had a head start. Their executives feel that this "open-door" policy saves them infinitely more patent worries and litigations, than it costs them in foregoing the (questionable), monopoly of their own inventions and discoveries.—*Electronics*.

Adjust stop stud laterally if necessary so that pad shoe arm may clear washer and seat on stud. Loosen pad shoe adjusting screw B, Fig. 4. Place a double thickness of film on upper sprocket and by means of new pad shoe arm stop screw adjust shoe so that it just touches the double thickness of film; then tighten pad shoe adjusting screw B, Fig. 4, and lock nut on pad shoe adjusting screw. Break off or remove old pad roller arm spring. Attach new gate latch L-176-R, Fig. 2, to mechanism by means of screw S-1068-E, Fig. 2, in place of old film trap lever and screw already removed.

Remove old film protector from film gate and replace with new film protector and gate latch release plunger either R-78 or R-81, Fig. 2, depending on type of film gate being used. (Note: *Film protector with plunger R-78 should be used on all gates having floating upper shoes whereas R-81 should be used on all gates having fixed upper shoes.*) Replace film gate on mechanism and if plunger does not properly operate to release gate latch, loosen film protector attaching screws and adjust film protector until the plunger assumes the correct position with relation to the latch and operates satisfactorily. Then tighten film protector attaching screws. Attach new intermediate shaft collar C-393-R, Fig. 2, in place of collar originally removed, being sure to take out all lateral play in shaft. Attach intermittent sprocket cover C-388-R, Fig. 2, to right back cover E, Fig. 1, using two screws from old right door hinge to fasten. Attach right back cover to mechanism in original position.

Attach turret complete R-60, Fig. 3, to mechanism, being sure it is pushed inward towards center frame as far as it will go. Fasten in place by inserting in right-hand side of turret frame two screws removed from old front cover, using washers W-237-R, Fig. 2, under screw heads. Do not tighten up these two screws until later



instructed. Fasten lower part of turret frame to mechanism by inserting screws S-1059-R, Fig. 2, through plate P-598-R, Fig. 2, as shown on front cover of book. After making sure that turret frame is pushed in as far as it will go, securely tighten screws in right-hand side of turret frame and screws S-1059-R just inserted.

Remove from old door the glass clips, glass, knob, latch and lock plunger and attach, in the same positions from which they were removed, to new door R-69, Fig. 3. Attach door R-69 complete to main turret casting, using hinge screws from old door. Be sure to adjust door hinges so that

door swings freely and adjust door latch so that it will readily lock and unlatch. Replace magazine roller holder using screws originally removed. The mechanism may now be set upon the stand and the lenses properly set and focused upon the screen by observing the instructions.

Note: The parts R-68 and P-502-R are a crank shaft extension and lens mount plug, respectively. The lens mount plug should always be used in place of one lens where only two lenses are in use. It acts as counterweight and assures smooth operation of the turret under these circumstances.



## Book Review



**THE SELENIUM CELL**—By G. P. Barnard (with a foreword by John W. T. Walsh). Nine chapters, 331 pages, stiff buckram binding. Published by Richard R. Smith, Inc., 12 East 41st St., New York. Price \$9.00.

EVIDENCE of the growing importance of the selenium cell (photo-conduction type of light sensitive cell), is to be had in the renewed activity by a number of prominent laboratories in connection with experiments with this cell. It is not generally known that a number of theatres included in one of America's largest chains have been using selenium cells for the past year with encouraging results. A careful check is being maintained on the performance of this type of cell for purposes of comparison with the more commonly used photo-electric cell. Which all goes to prove that the selenium cell is far from dead, as has been widely advertised by some of the lesser lights in the engineering ranks.

While it is not the intention of this reviewer to enter into any discussion of the comparative merits of selenium and other forms of cells, it is interesting to record here that selenium certainly has withstood gallantly the test of time, it having been the first form of light sensitive cell used by many early investigators (Ruhmer, Lauste, Ries, Wein, and others).

The preface states that this "book has been written in an endeavor to meet the want of a precise and accurate survey of the phenomena"; and it is my opinion that the author has accomplished this end. The book is a fine exposition of the planographic arts, with the illustrations being particularly noteworthy. Numerous references are given at the end of each chapter, enabling the reader to gain easy access to further data on the subject matter of each chapter.

Chapter 1 refers to the general chemistry of the element; while the following section treats of selenium cell construction. The latter part of Chapter 2 is devoted to what the

author prefers to term "primary selenium cells," but which we should choose to term the "Becquerel effect" (photo voltaic cells). On this point we differ with the author, because a selenium cell has as a functional characteristic a change in resistance; while the "Becquerel effect" is gained as a result of chemical action accelerated by light, which is something quite different. Considerable data has been supplied by this reviewer at various times on the difference in these functional characteristics:—photo conduction (selenium); photo electric (alkali metals); and photo voltaic (liquid cells).

The third chapter deals with general characteristics (physical), of the element, as well as with a study of the crystal structure. Chapter 4 is a survey of the effect of light on selenium; while the following chapter is concerned with the various theories advanced as to why the selenium cell changes its electrical resistance when subjected to light. Chapter 6 and 7 set forth the many applications for selenium.

In many respects chapters 8 and 9 are the most important in the book, for they are concerned with the adaptation of selenium cells to sound reproduction work. The opening remarks of chapter 9 credit this reviewer with "one proposed scheme" for using selenium cells in sound motion picture work. Subsequently "Ruhmer in 1908" is credited with having invented the "photographophone." In the interests of accuracy it should be recorded that this device was originally built in 1899 and described in the technical press in both Germany and America as early as 1900. Many references to this early art were published under the signature of this reviewer in various issues of MOTION PICTURE PROJECTIONIST. It is a matter for surprise that the fine pioneering work of Eugene A. Lauste, whose patents of 1906 are now the basis of so much discussion, is not referred to.

On the whole, this book is an intelligent survey of the technical literature relating to the selenium cell, and it should be in the hands of every serious worker with light sensitive cells, irrespective of the application the worker may have in mind.—Samuel Wein.

### W. E. New 3-A Photo-Cell

Electrical Research Products announce the development and manufacture of a new, improved photo-electric cell, to be known as the 3-A, which will be supplied with all Western Electric Sound System installations in future. It will also be listed as a regular replacement part. Pending manufacture upon an adequate scale this new cell has been supplied in some cases in response to exhibitor demands at \$25 each. The price in future, as a replacement part, will be \$16.50.

In appearance the new 3-A cell resembles its predecessors. The difference lies in that the old cells made use of potassium as the photo-electric element whereas the new ones make use of another metal base, caesium. The advantages of the new cell are: a greater sound output with more effectiveness, immunity from the effects of shelf life and high temperature, greater stability and longer life.

### Mohair as a Sound Absorbent

Upholstering the seats in durable mohair velvet or velmo has solved the difficulty of reverberation to a satisfactory degree in several large and small theatres. Due to the peculiar structure of this material, echoes and reverberations are literally swallowed up in the maze of air passages between the fibres of the mohair. There may be as many as 40,000 of these erect little fibres to the square inch. Empty seats, upholstered in this material, therefore do not present a hindrance to the sound but are nearly as effective in absorbing extraneous sounds as are seats occupied by patrons.

Interesting tests as to the sound absorption properties of different materials have been made by Dr. William R. Barss of the Massachusetts Institute of Technology. Using cowhide leather as a basis of comparison and considering its sound-absorbing value as a rating of 100 per cent, he discovered that the sound-absorbing power of Moravis, a mohair plush, was 308 per cent; of chevron, another kind of mohair plush, 254 per cent; while cotton plush was 192 per cent. The superiority of mohair was thus clearly indicated. Flat upholstery fabric had sound-absorbing value of only 146 per cent. One reason for the relatively greater efficiency of the mohair is that its fibres do not mat down and become flat but remain erect thereby keeping the air passages open for the absorption of sound.



# As *The* EDITOR Sees IT

## ¶ *Proper Volume Control*

AMONG the more serious problems of sound reproduction awaiting solution is that of proper volume control. More than two years ago Mr. Carl Dreher, then chief engineer for RCA Photophone, Inc., made the pointed observation that the problem of volume control in the theatre always put him in mind of the story of the eminent progressive who, being asked in a locality noted for repeated industrial warfare what he thought about law and order, replied that he thought it would be all right but he had never seen any. Mr. Dreher's observation still retains its pertinency—although we cannot refrain from remarking that we thought he would settle the problem once we released him from New York and set him loose in the wilds of the Hollywood studios.

This last comment is pointless, for the reason that volume control is the problem not of the studio but of the theatre. The "squeeze track" and noiseless recording constitute very fine technical achievements, but they do not even come close to solving the problem of volume control. This is a task for the theatre. It might be said that efficient volume control in the theatre is possible, and numerous first-run (should we say *de luxe*?) theatres might be cited in substantiation of this claim; but everyone concerned with the production and reproduction of sound motion pictures must bear in mind that first-run theatres cannot be the sole consideration in matters of this kind; we must, in fact, bend over backwards in favor of the little subsequent-run fellows who are already at a great disadvantage in the matter of film mutilation.

It might also be said that an intelligent house staff, competently instructed and supervised, insures proper volume regulation. This statement holds true until that certain day arrives when one or the other of this staff is concentrating on a possible cure for indigestion or contemplating the time remaining before his shift ends. Big first-runs on Broadway might be cited as models of virtue in respect to proper volume control; but we have often heard sound reproduction on Broadway of such quality as to cause the audience to regret their having come into the theatre.

It should be obvious by this time that proper volume control from the projection room by the projectionist is impossible. This plan has been tried and tried again, and found wanting. We doubt that any projectionist will insist on his ability to handle this assignment. The plan which includes a paid observer in the auditorium has many advocates; but this idea is economically impracticable. The only remaining alternative is remote control from the auditorium by one of the house staff. This plan would not, of course, insure momentary "phrasing" of certain interludes

but it would permit periodic setting of the fader in accordance with house conditions. A skeleton cue sheet could be devised for any particular cueing desired for certain portions of the picture.

It has been said that projectionists object to the introduction of any remote control device. We see no good reason for any such objection, and we doubt very much if this feeling exists. If such feeling does exist, it should be dissipated immediately, for volume control has never been and is not now the function of the projectionist. If a satisfactory remote control device is available, by all means let us have it as quickly as possible.

## ¶ *Superior Craftsmanship Pays*

EVERY week that passes serves to emphasize anew the accuracy of the forecast made in these columns more than a year ago with respect to the responsibility of Local Unions to manifest as much, if not more, interest in the technical advancement of their members as they do in the matter of hours of work and wages. As a matter of fact, the two functions are synonymous, for the reason that the Local Union which interests itself in the advancement of its members as craftsmen practically assures them of proper working conditions and wages. The importance of this question cannot be minimized, and the time for hedging on the matter has passed. What is needed is action—prompt and vigorous.

There is no such thing as a God-given franchise to a particular group of men to monopolize any special field of activity, and this statement is not based on any such premise. But it should be apparent that the present Local Union members, by virtue of long experience and intensive organization work, have established a priority in the field of motion picture projection. This priority does not insure the perpetuation of the power of the Local Unions, but it does imply a strategical advantage in the matter of proper procedure in strengthening their ranks. Resting on one's arms is conducive not to progress but to sleep; and ever so many people have died in their sleep. Now is the time for the Local Unions to begin an intensive campaign which should be maintained until every organization member has attained to a degree of efficiency in his work that will eliminate the possibility of being displaced by another worker "just as good, if not a little better." The I. B. E. W., generally regarded as one of the outstanding organizations of any type in the world, subscribes whole-heartedly to the viewpoint that their men should get the work not merely because they are organized but because they are better craftsmen. And the I. B. E. W., let it be said, is getting results.



# Play Color Symphonies on "Color Console"

By B. S. BURKE†

**S**YMPHONIES in color will be played on the "Color Console" to be installed in the Cleveland Memorial Severance Hall, recently built by the Musical Arts Association, which will be the scene of many presentations of operas and concerts. Just as an artist sits at a pipe organ, with pitch and volume controls within his reach, and plays musical symphonies, so the "color organist" of the Memorial Hall will sit at his console, where within his reach are the controls of hue and intensity, and will produce color harmonies.

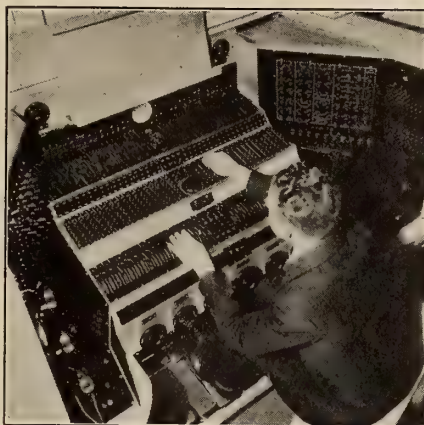
The lighting control equipment designed and built by the Westinghouse Electric and Manufacturing Company consists of a number of reactance type dimmers to control the intensity of the lighting, a vacuum tube unit to supply the direct current for the reactors, and a vacuum tube control for varying the tube unit output and the light intensity.

The most unique part of the control equipment is mounted in an organ console, similar to the console used for the organ in the Hall, which is portable and which, by means of a plug and cord, may be connected in either of two positions, on the stage platform proper or on the elevator platform in the orchestra pit. By means of this control console, the operator of the "color organ" varies the lighting effects in much the same manner as an organist varies the sound effects.

## Console Has 110 Circuits

The console is provided with thirty-six controls and the lighting in the auditorium proper is divided into 110 circuits. A remote relay board makes it possible to connect any one, or any group, of the lighting circuits to any one of the thirty-six control units on the console. The purpose of this arrangement is to obtain in a compact form the necessary number of control units for controlling the lighting for the auditorium. It was estimated that, at any one time, no more than thirty-six control units would be necessary, and that it would be possible to group the various circuits by connecting two or three lighting circuits to one control, thus obtaining the control of all the circuits in the auditorium.

In addition to the individual controls, the console is equipped with foot pedals similar to the foot pedals used in a regular organ console; however, in this case the pedals do not



Operator at "color console"

control the volume of sound but regulate the volume or intensity of the light. On the console are nine horizontal foot pedals which are so arranged that they may be connected to the individual controls to obtain the master control of the lighting effect. These horizontal foot pedals are divided into nine groups, so that each pedal controls the effects for four of the controls on the lighting console. In addition to the horizontal foot

pedals, there are four slanting foot pedals arranged so that any one of the thirty-six controls can be connected to any one of these pedals, thus obtaining master control of the group connected to the respective pedal. That is, should it be desired to dim half the lights of the auditorium and, at the same time, increase the intensity of the other half, it would be possible to do so by connecting one-half to one of the sub-master foot pedals and the other half to another sub-master foot pedal, and, by manipulating the pedals, change the intensity accordingly. Also, a grand

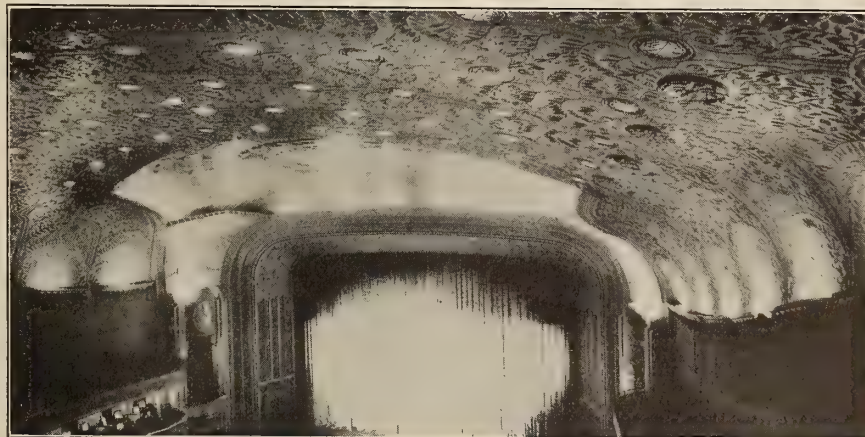
master control which enables all of the lights in the auditorium to be varied at the same time is provided.

## Proportional Dimming Effect

The control equipment is arranged so that it is possible for the operator to set up in advance four lighting effects, the intensities of which are predetermined and which may be changed by the manipulation of a single control. Furthermore, it is possible to obtain a proportional dimming effect by means of the master controls—that is, in dimming out a color that is a combination of two or more colors, the component colors will maintain their proportional intensity throughout the dimming process; in this way the hue of the color combination will not change. The controls are also provided with individual potentiometer dials, enabling the operator to secure the exact color intensities desired.

The purpose of the vacuum tube units used in connection with the reactors is two-fold. First, they supply direct current for the direct current coils on the reactors and, secondly, they are an interposing step between the control equipment and the reactors so that it is possible to make and condense the control equipment into such a form that it can be mounted in an organ console. The direct current for the reactance type dimmers could be supplied from other means, but only by the vacuum tube control equipment is it possible to use such a small control element on the console.

The main advantages of this type of control are: first, it is possible to preset the intensities of the lighting circuit for a desired number of scenes in advance; second, it is possible to obtain proportional dimming whereby



Auditorium lighting effects secured by "color organ"

†Switchboard engineer, Westinghouse Elec. & Mfg. Co.



color effect made up from a combination of colors maintains the same hue throughout the dimming process; third, and perhaps the most important advantage, the control equipment is so condensed that it conveniently can be mounted in a console which can be located either on the stage itself or on the orchestra platform, so that it is possible for the man controlling the lights to see the

lighting effects which he is producing, and thus vary them to obtain exactly the effect which he desires.

All of the above advantages are combined in the lighting control equipment built for the Severance Memorial Hall in Cleveland, which, it is believed, will constitute the most interesting and up-to-date lighting control equipment installed in this country.

## The 'Slit' Patent Case Decision

By JAMES J. FINN

THE conclusions to be drawn from the recent decision of the U. S. Court of Appeals in the case of General Talking Pictures Corp. and DeForest Phonoflms, Inc. vs. The Stanley Company of America (more popularly known as the Ries "slit" case, in which Western Electric Company assumed the defense for The Stanley Company), are a complete vindication of the opinions iterated and reiterated in these columns from time to time, particularly by Mr. Samuel Wein, research editor. Briefly stated, a correct interpretation of this decision is that the "slit" patents of Ries are *valid but not infringed* by the defendant. This explanation may appear ambiguous, yet it is perfectly understandable to those familiar with patent procedure. It means simply that the Ries patent rights are valid *as far as they go*, but, unfortunately for the owners, they do not go quite far enough.

The Ries slit patents cover a mechanical means for light-confinement and extend on to cover the method of mounting with respect to the moving film. Western Electric, on the other hand, utilizes a mechanical-optical slit which, apparently, Ries neglected to include in his claims. As a matter of fact, if one reads between the lines of the Appeals Court decision in this case, one may see where the Court in effect declares that the failure of Ries to broaden his claims to include this feature is regrettable. This advice is poor consolation to those who backed the Ries patents; and all in all, the Appeals Court decision leaves the "slit question" in as uncertain a state as previously.

Another phase of this controversy on the slit is the claim of T. W. Case, on the point of *specific dimensions* of the slit. Case holds that anyone using a slit for light-confinement for the purpose of reproducing sound from film is infringing on his patents; and his claim appears to have considerable merit. It should be noted that Case holds not only a *specific purpose* but a *specific dimension* patent as well. Furthermore, so well are the Case patent claims drawn that he may conceivably be held to

control the situation in that a slit to be of any possible use for sound reproduction from film must necessarily conflict with his claims. It is hard to visualize a showdown on the Case slit patents which would result in any such decision as "valid but not infringed." For if the Case patents are valid, it appears more than likely that they will be held to have been infringed. Case's position is an exceptionally strong one.

It should not be thought that slits were unknown before the time Ries filed his patents. Slits as a light-confining medium for purposes of reproducing sound were known as early as 1890. Ruhmer, Lauste, and other pioneer workers in the art used the slit in sound reproduction work, with Ruhmer apparently having been the first. It should be kept in mind that all the claims in the Ries patent are method claims, which fact implies certain limitations.

Literature of the prior art is replete with references to the slit for reproduction purposes; and the present activity concerning patents is occasioning much surprise in well-informed quarters. Certain trained observers hold that there is not a single existing patent which would prevent anyone from beginning immediately to manufacture and sell a complete sound reproducing equipment modeled along conventional lines. In many cases of "licenses" the seller is disposing of that to which he has no title. The radio field gives many evidences of such practices.

Considered in its broad aspects this slit patent agitation appears no different from similar agitations on other seemingly controversial aspects of sound picture equipment. Settlement of the slit situation would merely clear the way for the introduction of a new patent tangle—say, some such discussion as how hard is a vacuum (a question which is pending); or the question of conventional circuits for amplification.

To the uninitiated the present patent situation in the sound picture field appears badly muddled; but the initiated, conversant with the prior art and grown wise in the methods of "procedure" in patent agitation, are not unduly excited.

## First Sight and Sound Studio Opens Soon in New York

Compactness is the keynote of New York's first sight and sound broadcasting studios soon to be formally inaugurated. In a typical office building at 655 Fifth Avenue, studios, control room, transmitter and reception room, comprising the New York radiovision headquarters of the Jenkins Television Corporation, are housed in several rooms on the sixth and fourth floors, while Station WGBS of the General Broadcasting System, located at Astoria, L. I., provides the very essential synchronized sound channel.

The radiovision studios on the sixth floor are a peculiar cross between broadcasting studio and motion picture projection room, for the reason that direct pick-up of living subjects and also film pick-up of film subjects, are both employed in providing an entertaining program.

### 'Flying Spot' Pick-up

The direct pick-up is in the form of the well-known flying spot. The subject poses before a projector that illuminates it with a sweeping beam of light, for the process known as scanning. The varying reflection of that beam of light by the subject on which it falls, serves to actuate a battery of photo electric cells, which in turn translate the varying light intensity into electrical terms. By means of several stages of distortionless amplification, the electrical variations are impressed on the powerful radio waves propagated by the television transmitter in the same building. Meanwhile, a microphone placed near the subject picks up the voice or other sound for transmission over the WGBS transmitter. The flying spot apparatus employed in these studios is of the latest refined type, with a choice of several lenses so as to permit of close-ups and long shots of the subject without changing the relative positions of projector and subject.

The film pick-up apparatus is not unlike the usual motion picture projector, except that the continuously moving film is projected on to a scanning disc behind which is placed a photo-electric cell. The film may be accompanied by synchronized sound records if desired or by unsynchronized records for incidental music, the sound being transmitted via the sound channel.

The control room adjoining the studios, contains a large switchboard with a variety of switches, lights, meters, and monitors for the complete control of sight and sound channels. The operators not only monitor the sound pick-ups in maintaining the desired level, but also monitor the sight

(Continued on page 32)



# Efficient Sound Reproduction

By R. H. McCULLOUGH

*Supervisor of Projection, Fox West Coast Theatres*

**H**ANDLING sound—making it go places and do things—is a science as exact as mathematics. Most of the people who work with sound get their results “by ear” literally and figuratively. The theatre patrons of today are wise to the quality in sound. Sound offers many different qualities and values. There are many problems in sound reproduction. Practical methods of correcting troubles take plenty of experience to learn and can usually be told in a very few words. Troubles that occur to one may not happen to another—however, it is always best to take advantage of the accumulated practical experience of others.

The wise public patronizes the theatre with the best sound. Long interruptions in sound picture performances have practically been eliminated. Every voice, effect, or music is governed by the condition of the reproducing equipment. Advanced knowledge given to the industry is responsible for the proper presentation and the proper operation of the sound reproducing equipment. Amplifiers do their work with only that material which is delivered to it and under the treatment which it receives. Perfect audition is obtained only by utilizing every vibration originally reproduced.

The present studio recording is considered very good—at first, it was more or less crude; however, experience caters to perfection. Many theatres used to alibi, blaming the recording for the poor reproduction; but now it is entirely different and the theatre with the poor reproducing equipment suffers through loss of patronage. The fact that the shadow is heard means that more and more is expected from the screen. Patrons expect much more than seeing lips synchronized with voice. They want quality with sound reproduction and without interruption.

## Film Reproduction Troubles

It is imperative that the Movietone light gate be cleaned before threading the projector for Movietone presentation. All projector bases should be permanently grounded. Never allow any outside source of light to come in contact with the photo-electric cell compartment during the time the film attachment is in operation, other than that source of light supply which comes from the reproducing lamp. A hum will be perceptible if the sprocket perforations project over in the light source of the sound aperture.

Idler rollers directly above the sound aperture should be inspected quite frequently to see that they are moving freely. If they are allowed to become cut, the film will move sideways, thus causing the sprocket perforations, or the dividing line between the picture and the sprocket perforations to project over in the light source, which will naturally cause a hum. Keep sprockets and idlers clean at all times. Always before starting the sound projector, adjust all meters to their respective operating values.

Some sound equipments include a photo-electric cell amplifier mounted on spring supports. Photo-electric cell amplifiers installed in this manner, should always swing freely. The rubber base has a tendency to swell, pushing the amplifier upwards and causing the amplifier to touch the housing; if such is the case, the rubber should be replaced to avoid mechanical noise in the pick-up. It is always necessary to inspect the cradle spring support so that they are of the proper length. Sometimes the wiring of the photo-electric cell amplifier will touch the component parts, which will also carry machine noise through the entire reproducing system.

## Crackling Noise

From the photo-electric cell positive terminal to the grid leak clip on the photo-electric cell amplifier there is a very small stranded wire. The constant vibration of the pro-

jector causes the amplifier to swing. This swinging causes the strands to break in the soldered connections, but leaving only enough contact to make connection, and as the amplifier swings a crackling noise will be perceptible. It is necessary to inspect these connections very closely. Crackling noise is often caused by the one-amp. midget fuse in the photo-electric cell “B” battery box being defective. Photo-electric cell “B” battery connections should always be soldered.

Two 45-volt dry “B” batteries are used in the photo-electric cell and pickup amplifier circuit of each sound projector; “B” batteries should never be tested for voltage and amperage after they have been standing idle, for when standing idle they recuperate to some extent, and during the first few moments of their use they will produce a higher voltage than they will after being in use for several minutes.

## Noise in “B” Batteries

When 45-volt “B” batteries drop down to 37-volts, they become noisy. Even new dry “B” batteries may sometimes be noisy. Noise in “B” batteries is caused by fluctuations in voltage resulting from poor or defective cell insulation which is not entirely moisture-proof, by the quality of compound used in the cells or by impurities in this compound, by faulty cell construction, and by loose internal connections.

Dry “B” batteries should be tested

## Fake Subscription Solicitors

**R**ENEWED activity by certain canvassers who represent themselves to be subscription agents for MOTION PICTURE PROJECTIONIST necessitates repetition of past warnings in connection with this matter. MOTION PICTURE PROJECTIONIST has no subscription representatives, and anyone representing himself as an authorized agent is an imposter. Subscriptions may be placed only through your Local Union office (usually the Secretary), or direct to the office of publication at 7 West 44th St., New York City. Subsequent to the appearance of this notice, MOTION PICTURE PROJECTIONIST will not be responsible for any subscription taken by any agent outside of your Local Union. The attention of your Local Union Secretary should be directed to this notice.

**MOTION PICTURE PROJECTIONIST**



for noise with a head-set connected in series with a one-microfarad condenser. Place the tips of the leads on the battery terminals and listen for noise. Be sure that connections between battery terminals and headphones are perfectly tight, as any slight movement in connections will cause a noise in the phones, and will give an incorrect test.

#### Use of Soldering Irons

It is imperative that every projection room where sound equipment is installed have a good electric soldering iron on hand. In amplifier circuits it is absolutely essential that all the connections be mechanically and electrically tight. If this is not

the case, there may be considerable loss of energy due to high-resistance joints, or reproduction may be noisy due to a loose connection.

A soldering iron used for amplifier circuits must have a long, narrow nose to enable the user to reach into places which are inaccessible with a heavy iron of the kind used by tinnermen. Some sort of rest is necessary to lay the hot iron on while it is not in use. Recently a serious film fire occurred, due to negligence in laying a hot soldering iron down on a rewind bench. It is very essential that hot soldering irons be protected with a hood, so as to avoid any possibility of coming in contact with anything flammable.

## Structure and Function of the Skin

[The Second in a Series of Articles on Modern Physiology]

By C. T. GRAHAM-ROGERS, M.D.\*

THE general conception of an occupational disease is, that in some way it must be associated with individuals who earn their living by hard manual labor, in an environment of fast moving machinery, excessive noise, or an atmosphere heavy with dust or fumes. As the early health authorities delighted to express it "noisome substances." Such a mistaken idea in the light of modern times and conditions should not be entertained. All the occupations are not connected with industry, yet some present a more grave health hazard than do those in industry. Likewise, many industrial processes are quiet and free from dust or fumes, yet take a greater toll of health than do the more noisy and odorous ones.

Occupational diseases are those changes in the human body due to the effect of harmful substances, process of manufacture, or vocation. These are not new diseases, they have always been with us, it is obvious that they are no different from the general diseases of the human body, except that, in the case of industrial life, we at least have a known definite origin.

Nomenclature and classification of occupational diseases has advanced but little. The diseases of the skin, which is but a special branch of medicine, still awaits standard grouping.

Dermatitis means an inflammation of the skin, and while the greater part of the occupational diseases of the skin are in truth dermatitis, every case of dermatitis does not present the same characteristics as does an occupational disease such as chrome or arsenic, in effecting the skin.

To the laity, skin diseases are not considered as perilous to life, but it is common knowledge that these conditions are a cause of numerous cases

of illness. While it is true that many cases of skin disease present no systematic disturbances, in some circumstances the skin lesion is small in comparison with the serious systemic toxicity present.

#### Structure of the Skin

To have a clear understanding of the abnormal changes which may take place in the skin, as a result of exposure to industrial or vocational activity, it is necessary to have some knowledge of the structure of the normal skin, as well as its functions.

The skin, the external covering of the body is a most complex and important structure, and may be considered as an organ of the body. According to the embryologists, the skin is developed partially, and the central nervous system wholly from the epiblast, which may have a bearing on some of the symptoms observed during the course of occupational diseases. The density of the skin varies in different situations from 1/100 to 1/8 inch. This too plays a part in the history of an occupational skin disease.

The skin is composed of two layers: the epidermis, which is the outer layer; the corium cutis vera or true skin, which is the layer under the epidermis. These layers in turn are composed of a number of layers of cells.

The epidermis, which is the protective portion of the body, is the same as a shield or armor, and contains no blood vessels, but in this portion of the skin are contained the pigment cells, which serves to give the color characteristic to different races and individuals. The corium, or true skin, contains blood vessels, nerves, lymphatics, and the appendages of the skin such as hair, sebaceous glands, and the sweat glands. The append-

ages reach the surface of the body through openings in the outer layer of the skin, and it is through these openings that foreign substances are enabled to enter and cause trouble.

#### Functions of the Skin

Some of the functions of the skin are: It aids in regulating the body temperature; To furnish a protective covering of the body against external harmful substances or conditions; To aid in eliminating waste materials from the body.

Since it has been determined that the skin gives off carbon dioxide, it is considered as respiratory aid. It is sensory, in that it possesses tactile sensibility, or sense of touch. And due to its origin there is a psychic function, which is shown by the palor of flushing during emotion.

The sweat glands, which at times assist the kidneys, pour forth perspiration, or sweat, which consists of sodium chloride, traces of fat, fatty acids, cholesterol and urea; the urea may be considered as an ammonia compound. The sebaceous glands secrete a greasy substance. Thus the question of activity, of amount of perspiration, or other secretions of the skin, must be considered in any examination as to cause of an occupational skin disease.

#### Occupational Skin Diseases

The major causes for occupational skin diseases may be classed as: physical, mechanical, chemical, and bacterial. A further division may include: light, or radiant energy; temperature; dust, fumes, vapors; liquids; friction; bacteria (low forms of animal or vegetable life); systemic conditions of the individual; allergy or idiosyncrasy.

Were we to judge the incidence of occupational disease by compensation statistics, dermatitis would stand out prominently, but there are no general morbidity statistics to sustain this data.

Dermatitis may result from a large number of substances, such as caustics, acids, glass wool, cement, brick, coco bola or red woods, fruits, arsenic, chrome, dyestuffs, inorganic, and organic, the petroleum products, and in fact, a large variety of what are called chemicals.

The action of all these substances are not confined to local external areas, for whatever gets on the hands, soon finds its way to the respiratory apparatus, and the digestive tract, for it is known that many substances which cause a dermatitis through local application, will produce the same skin manifestations when absorbed by inhalation or swallowing. This circumstance must not be overlooked in our seeking a cause. Conversely, a dermatitis may have had

(Continued on page 45)

\*Abstract of a paper read before the N. Y. State Safety Congress, Syracuse, N. Y., Dec. 3, 1930.



# Visual Fatigue and the Motion Picture

By DR. LUCIANO DE FEO

Director, International Educational Cinematographic Institute†

## II

THE final results of the practical enquiry carried out by the I. E. C. I. among pupils of different ages in various kinds of schools accord not only with the opinions of the health specialists and oculists requested to give their views while the enquiry was proceeding, but with the conclusions suggested by the partial results of the enquiry.<sup>1</sup> With regard to the first group of causes of eye-fatigue, to which we may add the remarks about flicker, colour films and, especially, over-long films, the following conclusions were reached:

- (a) the films used should be in good condition, and the borders untorn;
- (b) the projecting apparatus should be in first-class condition, so that jerky projection should not be produced by worn rollers;
- (c) speed of projection should be properly regulated;
- (d) captions should be few, printed large, and clearly legible;
- (e) projections should not last too long. (Note: Sound pictures exert a great influence on sections c and d.—Editor.)

The first point is a matter for the attention of the censorship and the authorities entrusted with the surveillance and control of public shows. The officials charged with examining films from the point of view of their moral, political, and artistic content, ought also to ascertain the condition of the copies, and demand, before granting definitive permits for exhibition, that the films, under expert examination, should be found free from blemishes and undue wear and tear. At a later stage, while the films are going the rounds—and on the assumption that the censors examine only one copy, while the concessionary of the film has had a number of copies taken from the negative—some special class of officials or experts ought to be charged with supervising the condition of the films during public exhibitions.

### Stricter Examination Urged

Under the censorship regulations, very few countries demand a preliminary examination of all the copies of films for which permits are demanded, and when they do so this is only so as to make sure that there is perfect identity between the scenes contained therein. The competent au-

thorities only in a very few instances examine the films from the point of view of the hygienic exigencies of sight. The most recent instance of this sort to our knowledge occurred in Hungary, where, in 1929, according to official information communicated to the Rome Institute by the President of the National Censorship Commission, the authorities prohibited the exhibition of a film that was regarded as pernicious to the sight.

The preceding installment of this article stressed the serious social injury caused by the absence of any such time-limit under nearly all censorship systems. We might add that the social damage goes hand in hand with damage to the eyes. The concessionaries of films are usually entitled to reproduce a given number of positive copies from each negative. The unlimited opportunities afforded them by the censorship permits induce them to send the films round again and again *ad infinitum* from the large to the small centers. When the copies are in such a bad state that they can no longer be presented to the public of big cities, they are packed off to out-of-the-way places to do their damndest both socially and ocularly. It is therefore essential that the control exercised by the police authorities and experts in this field should be supported by legislative enactments limiting the duration of permits or, at any rate, limiting (by a stamp to be applied to each copy projected on the screen before the title of the film itself is projected)—except in very exceptional cases—the age of the copy that is about to be shown. (Note: British Columbia fire laws provide for such examination.—Editor.)

### Technician's Responsibility

All this applies to films that are to be shown in public cinema halls. In the case of those belonging to school collections, on the contrary, or to official, semi-official, or private bodies and organizations, the control of this point would rest more properly with the technician-operator in charge of the projection, and ought not to be hampered by any financial considerations which may excuse, if not justify, the resistance of public cinema managers.

The second point that emerges from the enquiry is closely associated with the first, so far as the possibilities of control are concerned. Apart from the efficacy of expert inspection in the projection cabins, to check the condition of the apparatus, it should

be noted that, although in point of technique we have attained to a normal projection velocity of 20 to 24 images per second. (Note: 24 images per second with sound pictures.—Editor), there is still in fact an imperceptible intermittence between the images, which may, in the long run, cause fatigue to the eyes of a person of normal sight. In addition to this, the intermitted projection causes a state of nervous tension which is altogether detrimental to the exact observation of the pictures.

### Suggest Continuous Projection

These defects might be corrected and the perforation of the films avoided (thus lengthening their life), by a system of continuous-movement projection with optical compensation, which, by getting rid of the shutter, would practically ensure un-intermittent projection. From the technical standpoint, there are a number of continuous-movement projectors, but few of them are practical in the using. This is especially true of the big apparatus required in large public cinema halls, where few have so far worked satisfactorily.

Two classes of persons are concerned with the first two points: official or experts to whom the service of supervision is committed; technicians to study the possibilities of obtaining projection apparatus that minimises the wear and tear of film, especially at the perforated margins, which, by abolishing or reducing intermission, would ensure normal projection from the standpoint of eyesight.

The points stressed in the Lewis report—the angle of vision of the spectator, the proper distance of the screen, etc.—are also matters coming within the competence of the cinema police and depend on the observance of proper standards of building. This report, however, does not invalidate the basic concept that the cinematograph, as such, does not invalidate the eyesight of the audience, or at any rate does so no more than other forms of ocular activity, such as constant and tiring reading (the most frequent cause of short sight), attendance in strongly lighted lecture halls, theatres, etc.

### Projection Speed Important

Prof. Ovio's observation on the rapidity with which films are turned is obviously important. It should be borne in mind that films are usually

†Rome, Italy.

<sup>1</sup>Motion Picture Projectionist, February, 1931.



"shot" at the speed of from 16 to 18 images per second, while normal projection is made at the average rate of 24 per second. If the speed of the projection could be brought up to 40 images per second, the phenomenon of intermittence—which is certainly injurious to the sight—would be eliminated, but we should have a yet more hasty stampede on the screen, which, besides being anti-aesthetic and grotesque, would compel the eye to follow the scene yet more closely so as to keep pace with the movement; and this, in its turn, would injure the sight.

Under present systems, 40 photographs of film are not turned per second because the movements of the persons would become positively ridiculous; the normal rate of 20 to 24 images being in vogue. A half-way system is sometimes followed, which diminishes the intermittence, without getting rid of it, and which tires the eyes by the speed of the movement. Thus the damage is two-fold, though each of the two concomitant factors may be diminished.

Apart from the possibilities of continuous-movement apparatus already referred to, which deserves further study, it would be desirable to investigate whether, by a different system of photographing (by the slow or accelerated processes, for instance) it might not be possible to harmonize the spectator's view of the image with the reproduction on the screen. In any case, this is all matter for purely technical study, which can hardly present insuperable difficulties and might well succeed in correcting one of the worst drawbacks of the cinema.

#### Light-to-Dark Transition

Some of the oculists who have been called upon to cooperate in our studies have called particular attention to the captions, owing to the form of the type used and the brusque passage from the grey tones of the picture to the staring black-and-white of the change from brilliant light to the abother correlated phenomenon—the change from brilliant light to the absolute or quasi darkness of the theatres and to the possibility of making use of light screens referred to by Prof. Van der Hoeve. The expression "in full day-light" is hardly applicable here, because screens of the kind work properly in a half-light or semi-darkness, and in any case do not require absolute darkness.

In this field also diverse more or less efficacious and practical systems suggest themselves; most of them make use of transparent screens, which often absorb a good deal of light. Others are based on a system which makes it possible to produce on the white surface of the screen a state of shadow deeper than the surrounding shade, a state close akin to darkness, in such a way as to present

realistically the blacks of the projected image and to bring the light shades of the same into greater relief.

This system, though not free from practical drawbacks, seems to us likely to give the best results, as it allows of an intenser illumination of the auditorium, being based on the contrast of light.

#### Recommended Light Intensity

A French Review *Protection, sécurité, hygiène dans l'atelier*, the monthly bulletin of the Association of French manufacturers for protection against labour accidents (Paris, No. 4, 1930), points to the results of experiments that have been made on the various degrees of light desirable in localities of different kinds.

The intensity is indicated as *lux*, corresponding to the average illumination of a superficies of one square metre upon which a source of light, *lumen*, is reflected. The *lumen* in its turn may be defined as the quantity of light intercepted during a unit of time by a spheric superficies of one square metre, the whole of which at all points is placed at a distance of one metre from a source of light casting, in all directions, the light of one candle. The degree of *lux* is generally measured by an apparatus known as a *luxometer*.

This review recommends a light intensity of 30 *lux* for theatres during intervals and of 1 *lux* during projection.

But it is not the intensity of light in itself that does harm, it is the brusque change from semi-darkness to bright illumination, a gradation which is wont to jump 29 *lux* according to the able we have quoted. And this, as we have above said, could easily be obviated by lighting up gradually or by the use of coloured lamps.

It is possible, indeed probable, that technical improvements such as we have referred to above—elimination of intermittence, supervision of the condition of the films, and the introduction of a new type of screen that

would avoid startling contrasts of light and shade—will in time make it possible for children to attend film shows for a longer period without any damage to their sight. The introduction of colour may very probably contribute to this end (if films are made showing life in its natural hues, without exaggerating the red tones) and that of sound and talking films, by getting rid of the captions, thereby shortening the length of the reels.

#### Effect of Captions

In connection with this last point, one need only reflect that the captions prolong by one tenth, on the average, the length of positive films as compared with negative. Thus the standard part of 500 metres would be considerably reduced. Even allowing for the scenic necessity of drawing out certain scenes in order to synchronize them with the spoken words and the reproduction of sound, the films would still be freed from those elements to which we have referred and which are so conducive to visual fatigue (contrast of light and shade, effort to read the captions, etc.), and the eyes of the audience would be relieved from a considerable strain.

Short-sightedness is a purely personal defect. It can be corrected by an oculist. Not that instruments should be placed at the entry to cinemas to gauge the eye-sight of each spectator, but some rational form of propaganda might acquaint parents and those in charge of the physical and spiritual welfare of children of the danger a short-sighted child runs in visiting the cinema too frequently or without proper spectacles.

There remains the question of the *kind of show*. A dull film is physically and mentally tiring and, as a natural effect, fatigues the eyes of the youthful observer; the only remedy would seem to lie in recommending adults who take children to the pictures to choose films suitable for the children rather than *for themselves*. Then there is the extremely dramatic love-film which works on the nerves,

## Notice!

On and After April 4th the Address of  
MOTION PICTURE PROJECTIONIST  
Will Be

7 West 44th Street, New York

Please direct the attention of your Local Union  
Secretary to this new address:

7 WEST 44th STREET, NEW YORK



causes moral depression and physical and psychical disturbances which are bound also to react upon the eyes. This brings us to the question of censorship. Is it not a further reason for distinguishing between films that may be shown to everyone and films suitable only for persons above a certain age?

#### Summary of Enquiry

The observations suggested by the enquiry are many and varied, but they can be quickly summed up in a few main proposals, all of the technical or moral order, to which the right answer is not hard to find.

Technical defects are by no means the only cause of eye-fatigue, since the smaller localities, in which the cinemas are as a rule less well-equipped and up-to-date and where more or less worn films are regularly projected, furnish a smaller proportion of complaints than the big towns. There is no doubt, therefore, that other factors contribute to produce eye-trouble, factors having their origin in the conditions of life in our big cities: physical, mental and emotional strain, which especially in growing children leads to exhaustion and diminished powers of resistance; the use and abuse of strong light for study and reading and in public places; late hours and even food conditions.

It will be admitted that our study of the effects of the cinema on eyesight, based as it is upon nearly twenty thousand answers to a specific question, is more than a vague indication. Realizing that previous conclusions might have been invalidated by further study and new technical improvements, the I. E. C. I. desired to put the question afresh and, by reference to scientific experts and enquiry among children themselves, to test the value of opinions formed at an earlier date.

Finally, the conclusions to be drawn from this further study of the question are the same as those previously published. These conclusions, which with additions we reproduce below, reveal those drawbacks of the cinema most frequently met with but most easily disposed of:

1. Films as such do not have any injurious effects upon the eyesight of persons whose eyes and nerves are in a healthy condition.

#### Technical Aspects

2. The phenomenon of intermittence, the excessive speed with which films are projected, proximity to the screen, the use of damaged, worn or perforated films, flicker and the use of defective apparatus may be considered the chief causes of visual fatigue and may have serious consequences, especially for persons with weak sight or neuropathic subjects.

3. In most cases and particularly where children and young people are concerned, it is preferable:

(a) to project in full light or at any rate in half light;

(b) to prevent children from attending evening performances and to arrange special shows for them which will not include unduly exciting or dramatic films;

(c) to project each part of a film for not more than ten minutes or a quarter of an hour and to follow it with an interval of two or three minutes; and to avoid sudden transitions from semi-darkness to full light;

(d) to arrange cinema programmes so that long films alternate with short ones. Apart from exceptional circumstances, the ordinary programme should include one theatrical film in several parts of moderate length, a short cultural or scientific film and a topical film—this, by the variety of impressions made, would provide the necessary rest for the mind.

(e) to impose strict control over cinema theatres, as regards:

(i) permission to smoke, in view of the danger of fire and the need of ventilating the hall, not only at the end of the performance and in the intervals, but even during projection;

(ii) the arrangement of the seats, which should be such as to secure a comfortable view of the screen and save children a physical exertion which has a more or less direct influence upon the visual organs;

(f) closely to supervise the condition of films and projecting apparatus not only in schools but in public cinemas.

#### 51 W. E. Noiseless Recording Equipments Now Installed

Noiseless recording is being used by practically every Western Electric producer-licensee. How thoroughly Electric Research Products' engineers have gone about meeting the demand for this improved recording is shown by the fact that to date 51 noiseless recording units have been installed in West and East Coast studios. There are 41 units in the West and 10 in the East, located as follows:

*West Coast:* Warner-First National 16; Metropolitan Sound Studios 2; Metro-Goldwyn-Mayer 2; Paramount 13; United Artists 6; Universal 1 and Columbia 1.

*East Coast:* Audio-Cinema 1; Eastman Kodak 1; Jam Handy 1; Paramount 5; Paramount News 1; and Warners 1.

While noiseless recording does not entail any parts replacement as far as the reproduction is concerned, Electrical Research Products has voluntarily undertaken a nation-wide inspection and adjustment of the apparatus in every Western Electric-

equipped theatre. This inspection is more than two-thirds completed according to H. M. Wilcox, vice-president in charge of operations.

#### Nationwide Theatre Inspection

"In addition to their regular inspections the 500 engineers on our staff are covering every theatre in the country using our equipment," he said. "We are trying to do this work as speedily as is consistent with thorough workmanship. We shall probably have covered the entire country in another two months."

"The reports we have received leave no room for doubt about the reception noiseless recording is receiving. The public appreciates the finer quality of this new recording and is asking for it. We hear this from our field men, from exhibitors and in letters from the public. It is significant that exhibitors are capitalizing the opportunity presented by advertising, whenever possible, the fact that they are showing a picture with this new noiseless recording."

#### Non-Flam Film Stock

There is a good deal of activity at the present moment in connection with the production of non-flam film. At least three concerns are actively working on this problem and claim to have a satisfactory product. The trouble is that a laboratory product is rarely as satisfactory when it is put into mass production.

#### Large Non-Theatrical Demand

At first glance it would seem that there is not the same demand for non-flam film as there was in the past, before fire regulations in cinemas had become so strict. Nowadays the risk of fire is not appreciably greater in cinemas than in paint works, for instance. But the real demand for non-flam will come from non-theatrical sources.

Industrial users would be glad of a film that was not so brittle or short lived as the present non-flam 16-mm. stuff, and cinema projectors would probably find their way, in less than a year, into every church, social hall, hotel and dance hall, if a good safety film could be provided, as cheap as the present type. According to gossip, more than one of the big film makers have a satisfactory non-flam recipe in their safes; but they will only produce it when some really formidable rival product makes its appearance.

#### Professional Field Secondary?

The non-theatrical users of film threaten greatly to exceed the theatrical use, and only time can tell what the ultimate effect on cinema attendance will be. It is easy to make facile prophecies; but difficult to be accurate.—*The Bioscope*.



# Launch National Survey on Release Print

A NATIONAL survey among theatre projectionists will be the next step on the problem of release print standardization. The survey will be aimed toward the improvement of the specifications for release print make-up which have been used for the past three months by the Hollywood producing companies. Since the companies started to release reels with the uniform leaders and cues sponsored by the Academy, many letters of comment have been received. In general the standardizing work has been praised and exchanges report a decrease in unnecessary film mutilation which annually costs the industry many thousands of dollars.

Many projectionists have also offered suggestions for improvement on the basis of the practical experience with the new print make-up. The questions raised by these suggestions have been analyzed and it has been decided to put them up to the projectionists of the country for an answer.

In the survey which will be started within the next week the Academy will have the cooperation of the Projection Advisory Council, the American Projection Society, the Film Boards, distributing companies, and the various technical publications and organizations within the industry who have been assisting in the educational campaign to reach every wired theatre in the United States and Canada. More than 30,000 instruction booklets have been distributed since November.

## Entire Industry Cooperated

The Standard Release Print represents both a technical step in advance and a means to a larger end. The specifications were worked out by representatives of all the different crafts who handle the film from cutting room to theatre. That was co-ordinated technical research. Then one by one every Hollywood studio saw that the work was worthwhile and started releasing on Standard. Laboratories and exchanges were given their instructions. That was cooperative activity by the producers.

Then the Projection Advisory Council, the American Projection Society, the trade press, and the Film Boards tackled the educational campaign necessary to tell each projectionist in some 12,000 wired theatres all over the country that here was something new, something designed to improve the sound show, and something he had a part and an interest in if he is a progressive projectionist.

It goes without saying the studios are intensely concerned with the

Standard Print. Sound pictures have reached a point where tempo or pace in the action is very important in contributing to entertainment value. The cutters often face a most difficult problem locating suitable change-overs in a picture packed with rapid dialogue and music. Audiences

notice the breaks in sound between reels and the studios very properly want to use every frame of footage they can. All this means that projectionists must be able to make precision change-overs and hit the beginning of the incoming reel within a few frames, whereas in the old days

## Questionnaire to Determine Procedure

THE Standard Release Print plan as promulgated by the Academy of Motion Picture Arts and Sciences, with the cooperation of the Projection Advisory Council and the American Projection Society, has been in operation now for approximately four months, dating from the time when all sections of this country and Canada had received at least one standard print. It appears desirable at this time to record the developments in the plan during the past four months and to chart the way for the future; also, to undertake to clear away the air of controversy which has hovered over this plan in many sections.

First let it be recorded that the Standard Release Print is here to stay, and its adoption by the industry is assured by the determination of the various agencies concerned with the plan to press the work to a satisfactory conclusion. The time for plain speaking with regard to the plan has arrived.

Everyone is aware that certain existing features of the plan are undesirable. Following the extensive and intensive educational campaign launched by the Academy and the assisting groups, many critical comments were received—which is exactly what was wanted. This was no pet project of any one group but a cooperative effort of the technical branch of the industry to put its house in order. The comments received, particularly those expressing dissatisfaction with the plan, have been carefully analyzed; and stemming out of the mass of comment is a questionnaire soon to be released (a copy of which appears elsewhere in this article), which will serve to clear the way for standardization of a sort acceptable to the majority of workers.

The following statements should have the careful consideration of those who disapprove of the standard plan: Print conditions prior to the introduction of the Standard Release Print were disgraceful. It may be said that present conditions, even with the standard print, are but little, if any, better; but it should not be overlooked that the present campaign is being conducted with an eye to the future. Objection to the number and the size of the visual signal dots has been raised; also to the fact that all prints are not standard (a production delinquency); also to the fact that subsequent-runs are being further imposed upon as a result of the negligence of projectionists on prior-runs as well as by sloppy inspection work in the exchanges. These are valid objections. But all this will be changed. The visual signal dots undoubtedly will be reduced in number and in size; some means will be found to greatly reduce, if not eliminate, mutilation on prior-runs; studio practice will be strictly supervised with a view to effecting permanent improvements; and exchanges will come in for the same critical inspection as the theatre projection room. This is more than a mere wordy promise—it will be done. No one can deny that the standard release print is preferable to a white screen. And where is there to be found a representative projectionist who does not favor the standard? It is worthy of note that not one contributor among the many hundreds who commented on the plan had anything better to offer.

The projectionist has cooperated magnificently in the plan thus far. Not only projectionist leaders but studio workers and the industry's business executives have been amazed at the ready response elicited from projectionists in all parts of the country and in Canada. The writer has been asked by the Academy to extend to projectionists its sincere thanks for the cooperation afforded the plan; and it is no secret that projectionist leaders are indeed proud of their men. Projectionists have demonstrated their worth as craftsmen and enhanced their standing in the industry by their work on the standard.

There remains but one more job for the rank and file of projectionists, and that the extending of full cooperation to their Local Union officers in the matter of the questionnaire which is now being released. Upon completion of this task the way will be cleared for finishing up the job. Once the standard is set its enforcement will be undertaken in really serious fashion, which in itself will be a guarantee to projectionists that good work will be protected.

JAMES J. FINN.



it was all right if they came within a few feet.

#### Interest in Subsequent Runs

Now the Standard has been in the field for three months. As the old prints go out and the new releases come on, the projectionist finds some constructive ideas on how to make the Standard better for the conditions under which he works. So the Academy is asking the projectionists of the country to guide the next step. The Standard will either be enforced as it is or improved if projectionists say how it can be made better. Such developments as this must be on a

national scale like the problems they are designed to solve

It is particularly hoped the present survey will reach the projectionists in the smaller and subsequent run houses and in the non-circuit theatres. One of the primary aims of the Standard is to keep the print in better condition for the subsequent runs. The conscientious projectionist trying to put on the best possible sound show under difficulties with the prints furnished him is the man who should be considered in any technical development, even more than the projectionist in the de luxe house.

A copy of the questionnaire is appended hereto:

## Survey on Improving Standard Print

This is a national survey to get the constructive opinions of projectionists who have had experience with the Standard Release Print. It is sponsored by the Technical Bureau of the Academy of Motion Picture Arts and Sciences with the cooperation of the Projection Advisory Council and the American Projection Society. The Standard will be enforced as it is or changed, depending on what theatre projectionists want.

Since the producing companies started to release reels with uniform leaders and cues, many letters of comment have been received. Most of these said the Standard was a big step forward. Many also offered suggestions for improvement. The questions raised by these suggestions have been analyzed and it has been decided to put them up to the projectionists of the country for an answer.

Every projectionist is urged to give his opinion and experience. This will guide the producers in making Standard prints so they will be best for threading and change-over in all types of houses. The improvement of the Standard and its maintenance by projectionists and exchanges will mean that no projectionist will have to work with a print that has been mutilated with punch holes, pencil marks, scratches, or unnecessary patches.

Name..... Local No.....  
Theatre.....City, State.....  
Seating about.....If circuit, what  
circuit..... State run your theatre  
gets.....Sound Equipment: ERPI  
.....RCA..... Other (name)  
.....Theatre uses about.....  
percent sound-on-film; about.....  
percent sound-on-disc; about.....  
percent silent. Projectionists per  
shift.....

The cues in the Standard Release Print were intentionally made fairly large to start with. Now that projectionists have had experience with the Standard the cues can be made smaller, or their length or position can be changed if desirable. Or the cues can be done away with entirely if any better plan is offered that can be put into effective and economic operation in all the talking picture theatres throughout the country.

Are the cues about right now?  
.....If not, suggest improve-  
ments in size, number of frames,  
position or any combination of these.  
In other words:

(Size) Is the present size right?  
.....Should the cues be larger?  
.....Should they be a third  
smaller?..... Half present size?  
.....Present size but on fewer  
frames?.....(Number of Frames)  
Is four frames the best length?  
.....Should cues be only three  
frames?..... Only two?.....  
(Position) The cues are in the upper

right hand corner now. Is this the  
best place?.....Should they be in  
the lower right hand corner instead?  
.....

Do you have any other suggestions  
on cues?.....

While many pictures now being  
shown were cut and released before  
the Standard went into effect, the  
number of non-Standard prints will  
decrease. Once a picture has been re-  
leased on Standard the responsibility  
for keeping it so is on the exchanges  
and the projectionists as outlined in  
the instruction booklet.

In general are the leaders and cues  
in good condition on the Standard  
prints you get? That is: The syn-  
chronizing leader?.....The start  
motor cue?.....The change-over  
cue?.....The final eight frames  
after the change-over cue?.....  
Is any exchange sending you prints  
released on Standard but which the  
exchange has not properly inspected  
and kept according to Standard speci-  
fications?.....

What other technical matters should  
be taken up or improved in the in-  
terest of better sound picture pro-  
jection?.....

### British Favor Penalties For Film Mutilation

(From "The Bioscope")

This subject of "film mutilation"  
seems unending. The space given to  
it from time to time in the trade press

alone certainly shows no signs of fall-  
ing off. Yet, for all this punching  
and preaching, it remains as serious a  
menace today as it did years ago. In  
fact, it is growing steadily worse, and  
is now checking the progress of good  
sound. The life of "talkie" prints is  
still seriously impaired after a few  
runs, by what can only be described  
as wilful destructiveness on the part  
of so-called "operators."

It may be that we have in our midst  
operators who cannot even read, or,  
if they are able to read, their intel-  
lect is so dull that they cannot even  
understand a simple cut sheet. That  
is not altogether their fault, per-  
haps; it might rather be said to re-  
flect on the people who engage them.  
It must be recorded that individuals  
are employed as operators who would  
be better suited to a deaf and dumb  
school for the blind.

#### Punch Holes in Sound Track

During the period when Western  
Electric refused to allow film recorded  
by their system to be run over any  
apparatus excepting their own and  
R. C. A., film damage by punch-hole  
merchants was conspicuous by its ab-  
sence. This pointed to the fact that,  
as only far-seeing and enterprising  
exhibitors had them installed the best  
"talkie" equipments, it followed that  
only the best projectionists manned  
the sets. Hence the temporary im-  
provement.

#### Improvement Only Temporary

But what followed when the films  
were released to all and sundry?  
Gradually, but surely, one by one,  
week in and week out, these mer-  
chants added their respective change-  
over marks at the end of each reel.  
First, the punch holes, then the cross-  
es, then the whitewash, and so forth,  
until such time as some unthought-  
ful man cut off the length of mutil-  
ated film, and then the whole pro-  
cedure started all over again until  
it utterly ruined the film.

Why, gentlemen, it may surprise  
you to know that holes are now punched  
in the sound track itself, the idea  
being that the loud plop from the  
monitor horn is a better signal than  
the white flash on the screen. Words  
fail me to describe the practice, and  
my advice to managers is to return  
all such copies until the renter be-  
comes so thoroughly "fed up" that he  
will take steps to penalize exhibitors  
and projectionists who mutilate films  
in this way.

#### A Penalty Only Cure

Then, it must be hoped, by a sys-  
tem of elimination, these selfish and  
careless persons will be weeded out.  
That will be to the benefit alike of  
the renter, exhibitor, projectionist  
and, most important of all, the patron  
who pays for his seat—David Robin-  
son.



## First Sight and Sound Studio Opens in New York

(Continued from page 24)

pick-ups by following the pictures through the monitor televisior that forms part of the switchboard equipment. Through the glass windows of the control room, the operators may observe the artists before flying spot and microphone, signalling any necessary changes in placement.

### The Television Transmitter

The 5,000-watt Jenkins television transmitter is located two floors below the studios, yet sufficiently near to minimize the length of conductors between pick-up and transmitting equipments. The transmitter is licensed for operation on 2035 kilocycles, or approximately 147.5 meters. The television transmitter is connected with its antenna on the roof by means of a radio frequency transmission line. The transmitter, provided with a 5-kilowatt water-cooled DeForest tube for its final or output stage, is of special design to handle

the extraordinary wide range of frequencies required for satisfactory pictorial detail. Station WGBS, on the other hand, operates on 1180 kilocycles, or 254 meters, so that its signals may be tuned in by the usual broadcast receiver.

It is planned to inaugurate an experimental service from the new studios on or about April 12th. After a period of experimental transmission, the radio talkies studios will go on the air with a regular program. Elaborate plans are being developed so that the growing audience of lookers and listeners in may be provided with an endless flow of entertaining programs, through the powerful Jenkins television transmitter, W2XCR, and the regular broadcast transmitter, WGBS, which will operate jointly during several hours of each day in providing the radio talkies.

The radio talkies are tuned in by means of a special television receiver with radiovisor, handling the signals of W2XCR, for the visual end, and a standard broadcast receiver tuned in to the WGBS signals.

be explained how to determine whether or not a patent owner has the right to use the invention without risk of infringing any such prior patents of others.

### 2. Who May Obtain a Patent

Our laws say that "any person" may obtain a patent in the United States. The person may be a foreigner or an American citizen, adult or minor, male or female, black or white, Jew or Gentile, a college graduate or educated in "the school of hard knocks." There are no exceptions. "Any person" means anybody and everybody who complies with the legal requirements.

The true inventor, if alive, must always sign the application for a patent. If anyone else signs, the patent is invalid, and so of no value. There may be more than one inventor, in which case they are called "joint inventors," and each must sign the application papers as such. They then obtain a "joint patent." No one of them can obtain a patent for an invention jointly invented by all. Also, independent inventors of distinct and independent improvements in the same machine can not obtain a joint patent for their separate inventions.

### 3. When May a Patent Be Obtained, and On What?

Read the following paragraph carefully. It will answer many questions which are usually not understood.

"A patent may be obtained by any person who has *invented* any *new* and *useful* art, machine, manufacture, or composition of matter, or any new and useful improvement thereof. But it must not have been known or used by others in this country before his invention and not patented or described in any printed publication in this or any foreign country before his invention, or more than two years prior to his application. And it must not have been patented in a country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months before his application, and not in public use or on sale in the United States for more than two years prior to his application, unless the same is proved to have been abandoned."

To be patentable, then, the idea must be "new." Of that, more later. Also, it must have been "invented"—that is, conceived by the inventor through the exercise of the creative faculty, and not merely by imitation. Again, the idea must be "useful"—that is, applied to the production of a practical result. There is an exception to this last statement in "design" patents, which cover merely the aesthetic appearance or ornamentation of the article, and are not di-

(Continued on page 44)

## Patents: A series of instructive and interesting articles on how patents are obtained and sold.

By RAY B. WHITMAN

*Note: In this series of articles Mr. Ray B. Whitman, practicing patent attorney of 230 Park Ave., New York City, will explain in understandable non-technical language just what a patent is, how one is secured, and how it may be sold. In addition, Mr. Whitman offers to the readers of this magazine personal advice without obligation on any subject connected with patents, trade marks, designs, or copyrights. All inquiries should be addressed to Mr. Whitman in care of this magazine.—EDITOR.*

### HOW TO GET A PATENT

#### 1. The Real Nature of a Patent

**I**N the beginning it is important to correct an almost universal misconception, which alone is responsible for many serious losses to the uninformed. A patent does not, as many believe, give to its owner the right to make, use, and sell the invention. It merely gives the right to *exclude others* from making, using, and selling the invention as specifically covered in the claims of the patent.

The inventor who has conceived an invention, *providing no one else has previously been granted a patent on it*, has already the right to make it, use it, or sell it as he chooses. This is his common law right. And everyone else, as well, has the same right! Our government, by enacting our pat-

ent laws, has sought to encourage invention by granting to every inventor who applies, an exclusive right for the first seventeen years to prevent others from making, using, or selling the invention claim. If, however, this right has been previously granted to another on any part of the invention, then the later inventor is just as much estopped from using the previous invention as is the rest of the public.

Most inventors, and indeed many otherwise intelligent manufacturers and purchasers of patents, fail to grasp this situation. As a result, they proceed on the basis that the patent, having been granted by the government, gives them the right to *use* the invention. But as most patents are in the nature of improvements over older devices, it is frequently necessary for the inventor to employ also one or more of such older devices in order to make use of his own invention. And as it sometimes happens that some such former device or method is already covered by a patent to a later inventor, the later inventor finds himself in the unfortunate position of not being able to use himself what he can prevent others from using!

This very important point should always be kept in mind when dealing with patents. Later, under the heading "Infringement Searches" it will



# Everyday Science

## Aluminum Production Process

Aluminum is the lightest metal known, with the exception of magnesium, and until the year 1891 pure aluminum was produced entirely by chemical and metallurgical methods. The process of aluminum manufacture consists in the electrolyses of a fused mixture of fluorides of sodium, calcium and aluminum, in which alumina (aluminum oxide) is dissolved. When an electric current is passed through such a mixture of fused salt, using carbon electrodes, aluminum separates as drops of molten metal at the cathode, while oxygen is liberated at the anode and at once units with it to form carbonic acid gas. The bath is kept in a fused state by the heating action of the current.

The action taking place in the electrolytic bath is therefore virtually a reduction of the alumina or aluminum oxide by the carbon arc of the anode; but this reduction would be impossible without the air of the current to first separate the oxygen and aluminum, which have a great affinity for one another.

The aluminum separated at the cathode is in the molten state and falls to the bottom of the bath, and it is allowed to collect there, being removed at stated intervals, either by siphon or by tilting. Fresh alumina is fed into the bath at short intervals to replace that which has been decomposed by the current; and the process is therefore a continuous one.

The fused salts employed to dissolve the alumina do not undergo any change, but care must be given to the purity of these and of the alumina used for feeding into the bath, in order to obtain high grade aluminum by this process of manufacture, silicon and iron being the most troublesome impurities.

## Lightning Arrester

A lightning arrester may be compared to the steam safety valve. When an abnormal amount of steam is generated the increased pressure opens the safety valve. Lightning is an abnormal electrical pressure. The arrester is planned so as to try to stop this abnormal lighting pressure. Sometimes it does and other times it does not. An arrester sure to operate under all conditions has not yet been produced. Millions have been spent to perfect such a device from the time of Benjamin Franklin to the present.

## Protective Generator Relays

Protective relays for use with generator voltage regulators have been developed for the purpose of automatically lowering the voltage of a generator when abnormal current or voltage occur on the system and also to protect the system from any sud-

den rise in voltage if for any reason the relay contacts should stick, resulting in full field excitation being applied to the generators.

Relays have been designed for resetting either by hand or automatically, although for general application relays for setting by hand are recommended. Automatic resetting may result in setting up line surges, as the relay continues to cut the resistance in and out of the field circuit, depending upon the voltage variations, although the line may not be cleared of the original cause of trouble.

## Electric Meters Seldom Fast

Contrary to a somewhat prevalent belief that electric current meters often run fast, and so overcharge the customers, the records of electric light and power companies show that of the relatively few which are inaccurate far more are slow than fast.

Out of each thousand meters recently tested in New York, only two showed slight overregistering, while 23 registered less than the actual current which passed through them, and 975 operated entirely within the legally prescribed limits.

During 1929, tests made on 310,017 meters on the lines of the various companies serving the New York Metropolitan District showed that 302,231 were recording correctly, 694 were fast and 7,019 were slow.

These tests were not merely routine tests made by the company, but were divided into four classifications—period inspections as prescribed by law, checking complaints made by consumers directly to the companies themselves, complaints made by consumers to the Public Service Commission, and special tests directed by the company.

Out of a total of 2,188,121 customers, only 393 complained directly to the Public Service Commission that they thought their meters were inaccurate. Out of this number, only two were found to be registering fast, 13 were slow and 378 were operating according to state standards.

In addition to the complaints to the Public Service Commission there were 12,603 consumers who complained directly to the companies. Of this total, only 34 were found to be registering fast, while 418 were slow and the remainder were correct.

## Megaphone Preceded 'Phones

The first megaphone used to increase the power and distance of the human voice was probably formed by the speaker's cupped hands held in front of his mouth. The Greeks tried to increase the distance over which the voice could carry, at the siege of Troy, by using Stentor, whose "cry was as loud as the cry of 50 other men."

Horns of various shapes were un-

doubtedly used in very early times as speaking or hearing devices. Johann Beckmann (1739-1811), wrote about speaking-trumpets. He refers to "monstrous trumpets of the ancient Chinese" by which words could be heard and understood at great distances. However, he did not take much stock in these tales, but ascribed the invention of speaking-trumpets to the 17th century.

## The "Otacousticon"

There are records showing that an ear-trumpet, called an "otacousticon" was exhibited in London in 1668. This was in the shape of a huge glass bottle without a bottom which collected and magnified sounds.

This was followed two years later by a similar device referred to as a "speaking trumpet." Two inventors claimed the honor of being the inventor. This device was called by one of them the "Tuba Stentoro-Phonica." The largest speaking-trumpet of this type was five feet, six inches long and 21 inches in diameter, tapering to two inches at the small end. It was claimed that this trumpet carried the voice from shore to a ship three miles distant, with an offshore wind blowing.

## Air-Operated Fog Horn

The air-operated fog horn used today in lighthouses is a development of the old speaking-trumpet, and its early use is credited to Captain John Taylor, in 1845. It was intended to convey sound only, and not for voice transmission, but for some reason it was called a "telephone." This is believed to be the first use of this work, though it had no connection with the later experiments which resulted in the invention of the present telephone. This was first called a "speaking-telegraph," and later the name was changed to "telephone."

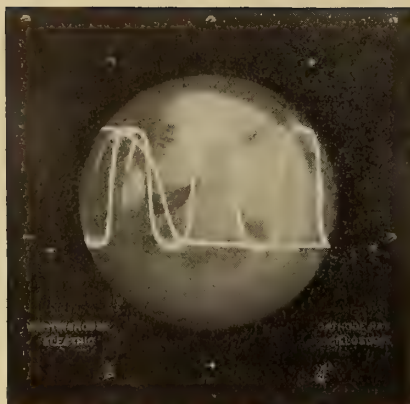
In 1851 a speaking-tube, called a "telekough onon," was exhibited in London. The same manufacturer also showed a speaking-trumpet called a "Gutta Percha Telephone."

In 1840 Wheatstone became involved in controversy with his former partner, Cooke, over the invention of the electric telegraph. In the arbitration which followed, the word "telephone" was frequently used, and this is believed to be one of the earliest uses of this word in connection with electrical transmission of words.

## "Talkie" of Voice Vibrations

A DEAD language came to life recently in a lighted room before the Greek class at the University of Pittsburgh when Prof. H. S. Scribner, head of the Greek department, spoke the famous Greek word "Eureka" into a new device developed in the Westinghouse Research Laboratories. As the word "Eureka" entered the device, curious lines very





Oscillograph record of Voice

much like an animated movie wriggled from left to right across a screen about the size of a large plate. These lines showed the "high" and "low" spots of the professor's voice. They made it possible for observers to distinguish the "pure" from the compound notes or tones which are heard by the human ear.

Words of other languages—including French, German, Spanish, and English—were spoken into the device, and other curious lines wriggled across the screen. For the first time a "moving talkie" of a human voice was shown in a lighted room before a large number of persons. This device makes "moving talkies" of all sounds, as well as those of the human voice. When a stone is dropped in a pond, this device enables one to see the "sound waves" which the splash creates just as the eye sees the water waves. It enables engineers to examine the "high" and "low" levels of various sounds, and thus, take their first major step in relieving the tremendous strain which city noises are said to impose upon the human nervous system.

#### Components of Equipment

It is entirely possible to dove-tail the high and low spots of many noises to produce, or approach, silence. For instance, two tuning forks with equal wave lengths or frequencies are set in motion. While each produces a note which is heard by the human ear, yet both together, under certain conditions, produce a "silent" note which is not heard by the human ear. The apparatus consists essentially of an ordinary microphone such as is used in radio broadcasting, the new cathode ray oscilloscope developed by

Mr. Osbon, and some batteries. The whole set-up can be packed in two large suitcases. The heart of this new instrument is the cathode ray tube of the oscilloscope. It resembles a funnel about the size of an old-fashioned phonograph horn-speaker. The large end of the tube, about the size of a dinner plate, fills a round opening on the front panel of the case. This is the screen upon which the movie talkies strut their stuff.

In the neck of the funnel is an "electron gun" that shoots a narrow beam of electrons toward the large end, or screen. These electrons strike the inside surface with a very high velocity due to the influence of high voltage impressed on a coating of silver on the inside surface of the tapered part of the tube. The bombardment of any small spot on the inside surface by a narrow high speed beam of electrons causes the spot to glow on the outside with a bright green light.

The bright spot is caused to move about on the screen by deflecting the beam of electrons as it emerges from the "muzzle of the gun." This is done by placing two pairs of magnetic coils at right angles on the neck of the tube near the "muzzle."

Through one pair of these coils flows a current generated by a special vacuum tube oscillator located in the lower compartment of the oscilloscope case. The magnetic field produced by this current causes the bright spot to move back and forth across the screen. The motion from left to right is linear—that is, at a constant velocity—and the return from right to left is at about fifty times the forward velocity.

This whole cycle, in a typical case, lasts only one-thirtieth of a second and is repeated time after time so that the path of the bright spot appears as a bright, straight, horizontal line across the face of the cathode ray tube.

Now, if alternating current resulting from a voice wave striking the microphone is sent through the second pair of coils, the magnetic field produced by it will cause the straight line to bend itself into the exact shape of the wave of the alternating current. Thus, the shape of any alternating current or voltage can easily be studied by connecting the current or voltage to the proper terminals of the oscilloscope panel.

## S. M. P. E. Makes a Special Study of Projection

The Society of Motion Picture Engineers has begun a specialized study in all phases of motion picture projection and has appointed three separate committees to carry out the work. The committees consist of the Projection Practice Committee, the Projection Theory Committee, and the Projection Screens Committee, with H. Rubin, W. B. Rayton and S. K. Wolf acting as chairmen of each committee respectively.

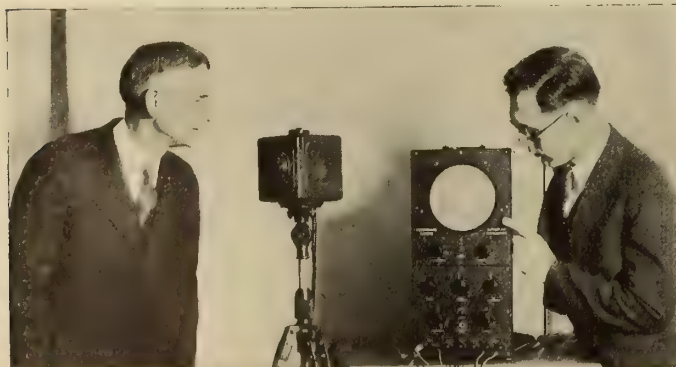
The Projection Practice Committee is dealing with problems such as the ideal layout of the projection room and is collaborating with theatre architects to insure the most satisfactory location of the projection room. Other problems under investigation are projection room routine and maintenance, monitoring and control of sound in the theatre, improvements in projector design and accessory, film buckle, prevention of film mutilation, and fire prevention. The committee is composed of H. Rubin, Chairman; T. Barrows, S. Glauber, J. H. Goldberg, C. Greene, H. Griffin, J. Hopkins, R. H. McCullough, R. Miehl, M. Ruben, F. H. Richardson, H. B. Santee and P. A. McGuire.

The Projection Theory Committee is making studies of the optical system of the projector, methods of diminishing eye strain, projectors with optical intermittents, and rear screen projection. This committee is composed of W. B. Rayton, Chairman; F. A. Benford, H. P. Gage, H. Griffin, A. J. Holman, J. F. Leventhal, W. F. Little and C. Tuttle.

The Projection Screens Committee is assembling data concerning the optical and acoustical characteristics of screens and from these data will make recommendations to the Standards Committee of the Society on a standard of screen intensity. It is composed of S. K. Wolf, Chairman; Dr. De'Amicis, F. Falge, H. Griffin, W. F. Little, A. L. Raven, C. Tuttle, D. F. Whiting.

## Many RCA All-A.C. Sets Installed

Between February 24th, when the first contract was signed, and March 14th, when the last report was made, one hundred and four complete units of the new RCA Photophone all-AC operated sound reproducing equipment were contracted for by exhibitors in the United States and authorized distributors in foreign countries. Sixty-one units were for domestic installations and forty-three were for foreign orders. Twenty-six of the latter were for theatres in England, with the remaining seventeen distributed among theatres in Chile, Argentina, the Philippines, India, Venezuela and South Africa.



Showing apparatus used in making oscillograph record of voice vibrations



## New H. & C Special Condenser Mount

UPON the comparatively recent introduction of the sound screen in motion picture theatres, a great loss of light was experienced, and the theatre which formerly projected a bright picture found its screen considerably darkened after the installation of sound equipment. There resulted a wild cry of help and a mad scramble in many directions in search of more light.

Carbons were overloaded, larger size carbons were tried out, and in some cases the current carrying capacities of standard carbons were increased, with very limited success, as far as screen results were concerned, and this very limited improvement was obtained at the expense of larger electric current and carbon bills, shortened life of burner mechanism parts, buckled film, etc.

The almost universal adoption of the rear shutter practically eliminated the buckling of film from overheating and it should be noted here that the rear shutter should be used with the new condenser system mentioned later in this article. Larger diameter collector lenses were used, but these still failed to produce desired results and indicated quite clearly that it was time for the optical people to come to the aid of the industry, as the old lens systems failed to produce satisfactory results and various relay systems also failed to solve the difficulty.

### Condensing System Helps

The Scientific Department of Bausch & Lomb Optical Company, Rochester, N. Y., saved the situation, to a considerable extent, by the development of their new light condensing system consisting of a 5½-inch diameter collecting lens, with a cylindrically ground curve on the rear, or

collecting surface, in combination with a 6-inch parabolic converging lens, the special curves of which allow the full diameter to be employed to advantage for the first time, thus giving very even screen distribution with an increase of more than fifty per cent. illumination.

With the Super-Cinephor objective lens recently developed by the same company, this system approaches the ideal nearer than other similar development of recent date.

During the experimental stage of this condenser system Hall & Connolly, Inc., immediately designed a lamp and housing to accommodate the new condensers.

This lamp was an advance in design to meet the needs of the de-luxe motion picture theatre. The larger lamphouse has a far greater air volume than the older types, insuring better ventilation, and the two condensers are incorporated in one holder, which insures a fixed spacing of the two lenses in the mount. The mounting and condensers are readily removed from the lamp as one unit. Special instructions for the setting of condensers are included with each set of lamps shipped.

### Design New Mounting

These new developments left the exhibitor, who had purchased equipment previously, in a rather awkward position, as he could not reasonably be expected to purchase complete new lamps, etc., to obtain the advantages of the new lens system (and many hundreds of exhibitors are at present in that position), with lamps in first-class condition. Realizing this fact, and wishing to place the best screen results possible within the reach of every exhibitor, Hall & Connolly designed a mounting for the special con-

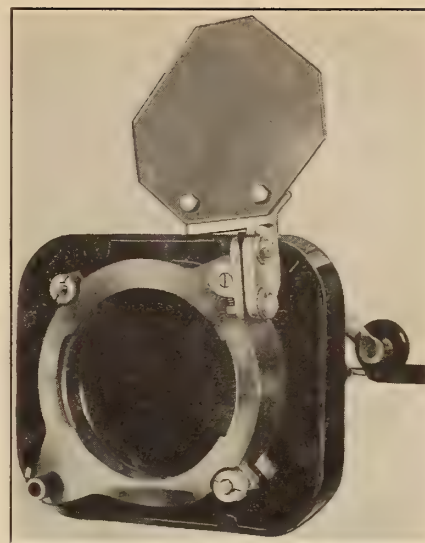


Figure 2

densers, so that they could be used with all the older types of lamps.

This mount, or holder, is readily attached to any of the older type lamps and is furnished in one complete assembly unit which utilizes the original screw holes in the lamphouse when the old mounting, in its entirety, is removed.

Complete instructions, regarding mounting, spacing and setting of condensers, together with distance of condensers from machine aperture are furnished with each mount sold.

The accompanying illustrations show this condenser mount complete, front and rear views, Figures 1 and 2, respectively. The rear view has the inside dowsers raised to show the general construction of the condenser holder rings. The prices of these adapters and condensers are such that no projection room should fail to take advantage of the superior projection which will follow their adoption.

### Detecting Burned-Out Tubes

A burned-out tube is easy to detect because the tube does not light. In this connection, study wiring schematic diagrams of equipment and see if valves are series-connected in any circuit; if so, the failure of one to light will put the other out also and installing a pair where two are in series-filament connection may not be necessary. It is the quickest way out in a hurry; but do not then fling away the two taken out, but save them and when opportunity comes, test them, leaving one of the replaced tubes in place and successively putting one of the old ones in the other contact.

The valve which does not light is the one to discard. Sometimes inspecting the valve will show the defective filament, but not if silvered surfaces intervene; and sometimes it may be failure of some point other than filament.

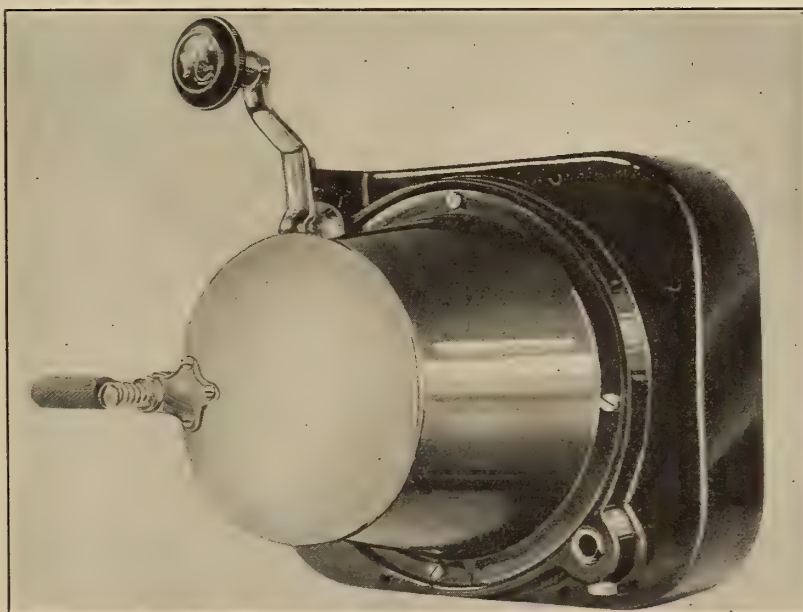


Figure 1

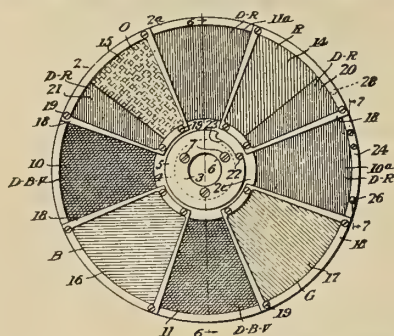


# Recent Patents—

Abstracts from the U. S. Patent Gazette of recent patents granted of particular interest to readers of *MOTION PICTURE PROJECTIONIST* by Ray B. Whitman, patent attorney, of 230 Park Ave., New York.

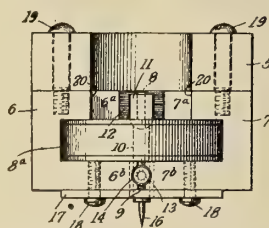
**1,794,727. SHUTTER FOR MOTION-PICTURE-PROJECTING MACHINES.** Frederick T. O'Grady, Flushing, N. Y. Filed Aug. 27, 1927. Serial No. 215,879. 15 Claims. (Cl. 88—16.4.)

1. A rotatable screen device for motion picture machines comprising a pair of shutter sections and a pair of anti-flicker sections all supported spaced apart around the axis of rota-



tion; two pairs of color filter exposure sections supported spaced apart around said axis; and means rendering said exposure sections adjustable about the axis relatively to the shutter and anti-flicker sections, whereby the exposure sections may be disposed in register with the shutter and anti-flicker sections or in register with the spaces between them.

**1,795,263. ELECTROMAGNETIC REPRODUCER.** Oliver B. Parker, Brooklyn, N. Y., assignor to Pacent Electric Company, Inc., New York, N. Y., a Corporation of New York. Filed July 19, 1930. Serial No. 469,069. 10 Claims. (Cl. 179—100.41.)

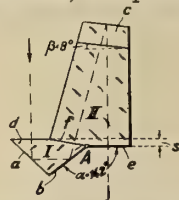


1. In a device of the character disclosed, the combination of pole pieces spaced to form a magnetic gap and a movable armature having a sliding engagement across the faces of said

pole pieces at opposite sides of said gap.

**1,795,092. SYSTEM OF REVERSING PRISMS.** Otto Möller, Wedel, Germany, assignor to the Firm of Carl Zeiss, Jena, Germany. Filed June 28, 1928, Serial No. 288,865, and in Germany June 18, 1926. 1 Claim. (Cl. 88—1.)

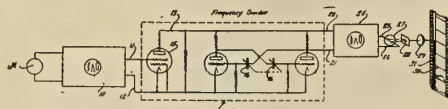
Reversing prism consisting of two parts cemented together and containing two ray-traversing surfaces which are parallel to each other, a roof surface and two non-silvered single reflecting surfaces, the plane of one of



these two latter surfaces forming on the prism with the plane of one of the said ray-traversing surfaces a re-entering angle, the cemented surface passing through the line of intersection of the said two planes, and the said roof surface being the last reflecting surface struck by a ray traversing the prism.

**1,794,664. METHOD OF AND SYSTEM FOR RECORDING AND REPRODUCING SOUND.** James R. Balsley, Beverly Hills, Calif., assignor to Fox Film Corporation, Hollywood, Calif., a Corporation of New York. Filed Nov. 18, 1929. Serial No. 407,925. 6 Claims. (Cl. 179—100.3.)

1. The method of recording and reproducing sound, that includes transforming sound waves into electrical current waves corresponding thereto, producing therefrom an elec-

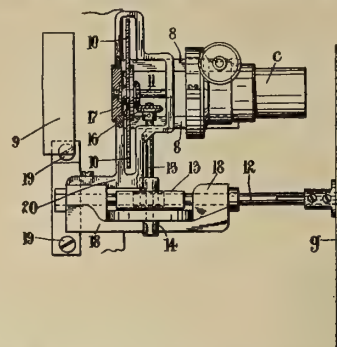


trical current wave of stepped down frequency, making a record of said current wave of stepped down frequency, reproducing from said record its recorded electrical current wave, producing therefrom an electrical current wave stepped up in frequency to match the original sound wave frequency and reproducing said last mentioned current wave as an audible sound wave.

**1,794,103. PROJECTION OF PICTURES, PARTICULARLY CINEMATOGRAPH PICTURES WITH QUASI OR PSYCHIC STEREOSCOPIC IMPRESSION.** Archibald Stannard Cubitt, London, England. Filed Apr. 3, 1925, Serial No. 20,539, and

in Great Britain Apr. 8, 1924. 6 Claims. (Cl. 88—166.)

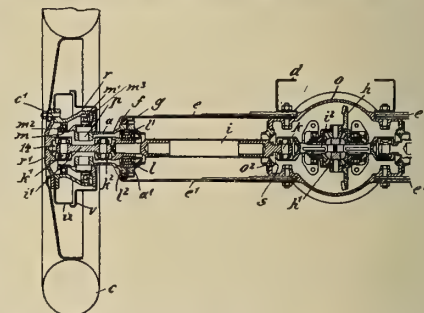
1. The method of producing relief effects in optically projected images



from a motion picture positive film having ordinary images thereon which consists in projecting on an ordinary screen, alternating images of sharp definition, and images of less sharp definition, by deviation of the projecting beam, the picture area on the screen remaining substantially in the same position for all the images.

**1,794,147. PROJECTING APPARATUS.** John Hartford Chidester, Chatham, N. J. Filed Mar. 22, 1926. Serial No. 96,524. 5 Claims. (Cl. 88—24.)

2. A projecting apparatus comprising in combination a ticker mechanism having a tape discharge means, a tape, means for feeding said tape in



a predetermined path, a display screen, a projecting lantern, and means including tending laterally in superposed parallel pairs from opposite sides of the differential housing, sleeves to which the outer ends of the springs are pivotally connected on axes extending parallel with the longitudinal axis of the vehicle, shafts mounted at the outer end in said sleeves to rotate and have universal movement and the inner end of the shafts having a universal joint connection with driving elements of the differential gearing, wheel hubs mounted on the sleeves to have movement about the axis thereof and movement about an axis in the plane of rotation of the wheel, and shafts having a universal joint connection with the wheel hubs and the first shaft.



## New Types of Photoelectric Cells

By A. R. OLPIN†

**K**NOWLEDGE of the photoelectric effect dates from 1887 when Hertz discovered that ultra-violet light, falling on a spark-gap, permitted an electric discharge to take place more readily than when the gap was in darkness. A second but allied effect was discovered the following year when Hallwachs observed that a well-insulated and negatively charged body lost its charge when illuminated with ultra-violet light. Both of these effects, although of the highest theoretical importance, were too feeble to be of any practical significance at the time.

The evolution of the photoelectric cell as it is known today really began in 1889 when Elster and Geitel discovered that electro-positive metals such as sodium, potassium, rubidium, and caesium exhibited photoelectric activity when illuminated with ordinary visible light.

The history of the modern photoelectric cell has been essentially that of the development of a technique for the proper handling of these chemically active metals in a vacuum. Early advances were made by improv-

ing the degree of vacuum so that the metals could be used in a purer state. More recent developments have come from treating the surfaces of these pure metals with limited amounts of various gases or dielectrics.

### Response Unlike the Eye

In popular literature the photoelectric cell is frequently referred to as the "electric eye" because it is commonly employed to do the work previously done by human observers. The response of the electrical eye to light of various colors, however, has generally been quite unlike that of the human eye. Of the photoelectric cells using pure metals as the light-sensitive element, only those employing caesium exhibit a response to colors that even roughly approximates that of the human eye.

The caesium which, of the pure metal cells, most nearly approximates the response of the eye, is difficult to make because affinity for oxygen and such a high vapor pressure that it is difficult to obtain or prepare in its pure form, and it is only the pure metal in bulk form that yields the form of curve shown. The rareness and consequent cost of the metal also

contribute to make it impractical for general use.

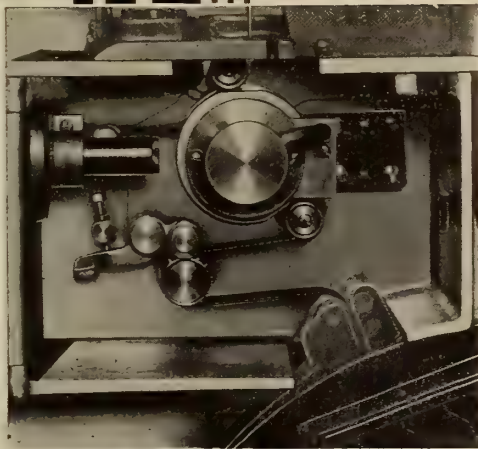
That an electrical eye should have a response similar to the human eye, however, is not necessarily essential. The shape of the response curve of the eye does not affect the appearance to us of an object in black and white—such as a photograph, an engraving, a printed page, or a pen and ink sketch. For correct reproduction of such objects all that is required is a response to difference in average intensities. The cell giving the greatest output per unit of incident energy would thus be most desirable for such purposes.

### The W. E. 1-A Cell

The No. 1-A photoelectric cell used up to the present time in picture reproduction and similar fields, has been one of the best cells available in spite of the fact that it responds selectively to blue light and is insensitive to red. The cell is made by ionizing hydrogen on a surface of potassium—a treatment which, as Elster and Geitel discovered about twenty years ago, considerably enhances the emission of electrons without greatly changing the color response from that of pure potassium.

Recent advances in photoelectric cells have been made by treating the surfaces of alkali metals with gases other than hydrogen, or with vapors

†Member of the Technical Staff, Bell Telephone Laboratories.



- ¶ Light beam less than .0005
- ¶ H.A. impedance output will be matched to your present main amplifier
- ¶ Disk to film change-over
- ¶ Shielded P.E. cell
- ¶ For all type projectors

Price on Request

## "SYNCROFILM"

SOUND-ON-FILM REPRODUCTION  
OF THE HIGHEST QUALITY

1. **SIMPLICITY OF DESIGN**, engineered by men who have studied and overcome the intricate problems of a fool-proof sound head with matched pre-amplifier.
2. **TRUE TONE QUALITY**, faithful reproduction of variable area, variable density, squeeze track by means of a super-condensed optical system that is unique and fully covered by patents.
3. **LATEST DEVELOPMENTS**, precision workmanship, wearing surfaces chromium plated, silent chain drive, even tension takeup thru aperture, in short . . . No one could ask for more!

## WEBER MACHINE CORP.

59 RUTTER ST., ROCHESTER, N. Y.  
EXPORT DEPT.  
15 LAIGHT ST., N. Y. C.

CABLE ADDRESS  
"ARLAB" NEW YORK

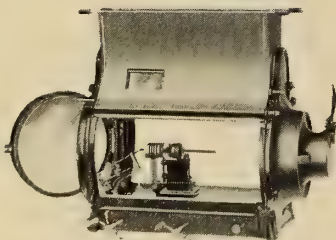


# STRONG

*delivers the light!*



**HIGH INTENSITY  
AUTOMATIC  
REFLECTOR  
ARC LAMPS**



When you buy  
a Strong Lamp  
you buy the  
very latest  
type equip-  
ment.

For Sale by Independent Supply Dealers

## The Strong Electric Corporation

2501 LaGrange St., Toledo, Ohio  
Export Office: 44 Whitehall St., New York, N. Y.

of various dielectrics such as sulphur or organic dyes. The results have been very satisfactory. The selective response has been found to depend not only on the materials used but on the ratio, in the surface compound, if the number of atoms of the sensitizing material to the number of atoms of the alkali metal. This ratio is usually very small and the technique for controlling it varies for the different metals because of the large differences in vapor pressures and chemical affinities.

In many cases small amounts of a suitable dielectric are sublimed from a side tube or small amounts of gas are introduced from a nearby bulb. In other cases, particularly where caesium is used, the procedure is decidedly more involved.

For such systems as sound picture or picture transmission where incandescent lamps are used as light sources and where, because only differences of intensities need be reproduced, no attention need be paid to color distribution, a caesium-oxygen cell has great advantages. For television, on the other hand, particularly where full color is to be reproduced, the requirements are different. In the color-television system, demonstrated in 1929, a satisfactory response was obtained by using both potassium-sulphur and sodium-sulphur-oxygen cells satisfactorily reproduces all colors.

### Adaptation for Television

Another interesting application of the use of cells of different responses was made in the recent demonstration of two-way television. Here a person at one end, at the same time that he is seeing the image of the person at the distant end, is being scanned by a beam of light so that his image may be transmitted. Early trials were made using cells sensitive only to blue light and employing a blue beam for scanning so as to obtain a light that would not dazzle the eyes of the observers in the booth. The potassium-sulphur cells were used. The system was very satisfactory in so far as glare from the scanning beam was concerned, but because only blue light was employed, the reds and yellows in a person's face did not appear quite natural in this reproduced form.

To improve this feature some caesium-oxygen cells were added. These cells reproduce the reds very well and to make them effective a red component was added to the scanning light which changed it from a blue to a purple. The purple light is just as satisfactory from the standpoint of glare, and the resulting image, because of the presence of reds, is much more natural. The combination of these two cells is practically insensitive to yellow light so that the booth may be lighted with a low-intensity

# ↓ F.S.C. ↓

## GENUINE OPTICAL CROWN GLASS PLATES

Surfaces with precision polish—Will not distort the Picture—Enclose all portholes for Sound Films

S.O.G. Condensers—Made of optical, heat-resisting Ingal glass  
Circulars Sent on Request

### FISH-SCHURMAN CORPORATION

45 West 45th Street

NEW YORK CITY



yellow light without affecting the television transmission.

Photoelectric-cell manufacture has now reached the point where selective response to light of almost any color may be obtained. The study of methods of sensitizing alkali metals is being continued. Among the profitable results already obtained are many valuable theoretical deductions which promise to aid greatly in the further development of the subject.

### New Century Motor Line

Century Electric Company, of St. Louis, Mo., announces a new line of fractional horse power motors having mounting dimensions interchangeable—in repulsion start, induction single phase, split phase, single phase, squirrel cage induction three phase, and DC types. The bearing brackets of this design offer unusual protection against falling objects, dirt, or dripping water. These motors have rolled steel frames, welded steel feet, slotted for belt adjustment, and bearings machined from phosphor bronze castings. They are equipped with the Century wool yarn system of lubrication.

### Wired Theatres in Antipodes

A total of 837 theatres are reported to have been equipped for sound in Australia and New Zealand, and the paper which compiled the figures, estimates that it cost \$2,500,000 to make the transformation. The servicing fees paid in the two countries work out at \$109,888 per year. Equipments in Australia are divided into 505 sets for film and disc, and 136 for disc only; in New Zealand, the figures are 167 for film and disc and 29 for disc only.

### Measurement of Capacity and Leakage of Condensers

THERE are a number of methods which can be used to measure accurately, the capacity, leakage and power factor characteristics of electrolytic condensers but such methods involve the use of apparatus not usually available to general experimenters and service men.

For all practical purposes, very good results in measuring capacity can be obtained by using a standard 110-volt microfaradmeter of the required range on electrolytic condensers, having peak voltage ratings of 400 volts or more. Before testing for capacity, the rated D.C. voltage of the condensers should be applied for five minutes. If the condenser has been off voltage for several months it may be necessary to leave it on voltage for longer periods up to a half hour before measuring the capacity or leakage.

One of the simplest methods of

## EASTMAN ANNOUNCES

### THE GREATEST FILM IMPROVEMENT IN YEARS

SOME years ago Eastman marked an epoch in emulsion making with its announcement of panchromatic motion picture negative film. Now Eastman makes another great advance with a remarkable super-speed emulsion which will unquestionably improve the quality of sound pictures, and which promises to effect substantial reductions in producers' lighting expenses. Yet it costs no more than previous panchromatic films. Its great advantages, gained without sacrificing any other desirable feature, represent clear gain to the motion picture industry. They stamp Eastman *Super-Sensitive* Panchromatic Negative, *Type 2*, as a real achievement.... Eastman Kodak Company, Rochester, New York. (J. E. Brulatour, Inc., Distributors, New York, Chicago, Hollywood.)

## EASTMAN SUPER-SENSITIVE

Panchromatic Negative, *Type 2*

### IN WESTERN CANADA!

## CANADIAN THEATRE SUPPLY CO.

Authorized distributors for

**SIMPLEX—MOTIOGRAPH—POWERS—HOLMES**

and all theatre equipment of the leading manufacturers. Also, an extensive line of stage equipment.

*Complete Sound Picture Service!*

**306 Canada Building  
Winnipeg, Man., Canada**

Alberta Representative

**M. L. ADAMSON**

**9921—113th St., Edmonton, Alb., Canada**



## Good Projection Requires Good Rectification



M. P. 25-25

## Good Rectification Means FOREST RECTIFIERS

THIS Forest Rectifier meets the demand for a single unit to supply direct current for two projectors, and will furnish 15 to 25 amperes to either projector continuously.

It supplies a steady direct current, free from pulsations, and will produce a better light than other current supply devices. The only wearing parts are the bulbs which will last at least one thousand hours and usually much longer since only two bulbs are being used at a time (except during change over) and the load is alternately carried first by one set of two tubes then the other two as the projectors are alternately used.

This Forest Rectifier embodies the use of four rectifier tubes which are connected to supply current to two direct current circuits independent of each other, thus preventing loss of current at the first arc when the second arc is struck.

Both arc can be operated at the same time during the change over period and there will be no diminishing of the light from one projector while lighting up the second.

Two Ammeters are mounted on the unit which will show at a glance the amperage being used at either arc.

Links are provided for operating from 110-220 or 240 volts.

Rectifiers for all purposes made in 15 amp., 25-25 amps., 30, and 65 amps. sizes.

We are specialists in our field. Send us your technical problems. Literature on request.

## FOREST ELECTRIC CORP.

New and Wilsey Sts.

Newark

N. J.

measuring both the capacity and leakage of electrolytic condensers rated at 300 volts D.C. peak or higher makes use of the circuit shown in Fig. 1. This test circuit can be constructed at low cost of material usually available in most service laboratories.

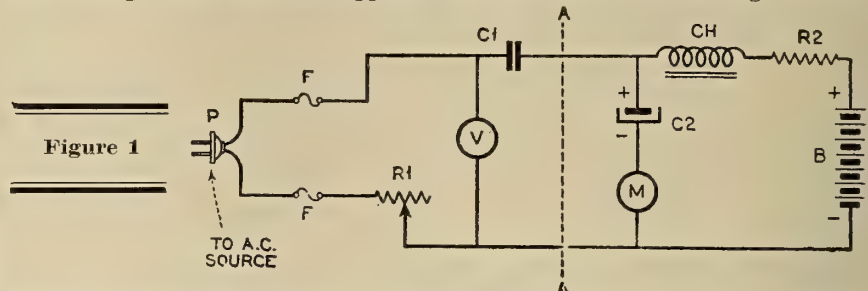
The most important point to remember in connection with the use of this test circuit is to connect the electrolytic condenser into the circuit with the proper polarity of the voltage source "B."

Since the difference in D.C. current leakage with different applied

in the chart which follows are based on the use of that value of capacity at "C1."

In every other way the circuit is foolproof, the milliammeter being protected, even in the case of a short in the electrolytic condenser, by the protective resistor "R2." The condenser "C1" limits the maximum A.C. current which can flow in the A.C. circuit.

To operate the test circuit, keep plug "P" out of the 110V. A.C. receptacle and connect the electrolytic condenser to be tested in the position shown. The initial leakage will be



voltages within wide limits is very small, the exact voltage of the voltage source "B" is not important as long as it is somewhat lower than the maximum peak voltage rating of the condenser and high enough to roughly approximate the conditions of operation. It must be, however, higher than the peak voltage of the A.C. voltage source.

The capacity at "C1" must be 4 mfd. since the current readings given

rather high for the first few minutes, especially if the condenser has not been in use for some time, but will drop quickly to a fairly low value.

A reliable leakage current reading should not be attempted until after the condenser has been connected into the D.C. circuit for at least five minutes. After five minutes the leakage as read on the A.C. milliammeter (which can be used for taking the D.C. leakage current readings) should drop to a comparatively low value of the order of .05 to .5 milliamperes per microfarad for a good condenser which has been in fairly constant use. If the leakage does not drop to such values it indicates a leaky or shorted condenser.

When the current reading has dropped to a satisfactorily low value (depending on the capacity and leakage characteristics of the condenser under test) insert plug "P" into a 110-volt A.C. outlet thus connecting A.C. voltage across the test circuit. Rheostat "R1" should then be adjusted until the voltmeter "V" reads 110 volts.

The current reading of the milliammeter should then be noted. The capacity corresponding to different current readings can then be found by consulting the chart shown in Fig. 2. If the testing outfit is to be made a permanent piece of testing apparatus, an additional scale can be drawn on the milliammeter so that the regular scale can be used to read the D.C. leakage current when making D.C. leakage test and the capacity scale can be used to read the capacity direct when making the capacity test with the A.C. source.

The scale of the 0-250 milliammeter cannot of course be used to give accurate leakage measurements. If accurate leakage current data is

### THEATRE EQUIPMENT

**NEW AND USED**

Most complete stock in the U. S. Moving Picture Machines, Screens, Booths, Opera Chairs, Spotlights, Stereopticons, Film Cabinets, Portable Projectors, M. P. Cameras, Generator Sets, Reflecting Arc Lamps, Carbons, Tickets, Mazda Lamps and Supplies.

Projection Machines repaired and overhauled. Repair parts for all makes opera chairs. Attractive 3 x 10 ft. muslin banners, \$1.50; on paper, 50 cents.

We Pay Highest Prices for Used  
Projection Machines, Opera Chairs, etc.  
Everything for the Theatre—Write for Catalog K.

**MOVIE SUPPLY CO., 844 Wabash Ave., Chicago**

## THE BIOSCOPE

The Leading Journal of the  
British Cinematograph Industry

20th Year of Weekly Publication

Contains a complete section each week for the special benefit of Projectionists.

Cash prizes awarded for original ideas published. Specimen copies 18 cents.

Annual Subscription 7 dollars 50

**THE BIOSCOPE PUBLISHING CO., Ltd.**  
8-10 Charing Cross Road,  
London, W. C. Eng.



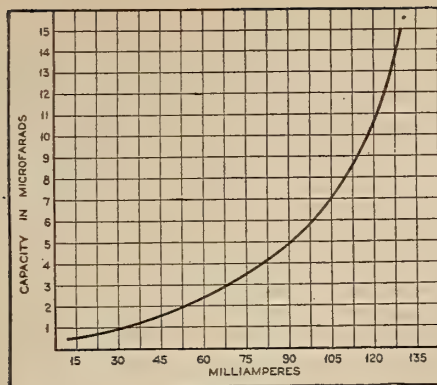


Figure 2

required, a lower range 0-10 or 0-25 milliammeter should be substituted for the higher range instrument as soon as the leakage drops sufficiently to permit the use of the lower range instrument.

Care should be taken of course not to use the low range instrument when A.C. is connected across the circuit, to avoid damage to the low range meter. The circuit to the right of the dotted line A-A can be used alone when leakage current measurements alone are required.

## Sound Pictures As Aid To New York Stage Play

When the Theatre Guild (N. Y.), production, "The Miracle of Verdun" opens it will present for the first time in stage history a new technique combining the possibilities of the stage with talking pictures. To accentuate the sweeping dramatic possibilities of the stage script the director, Herbert Biberman, is introducing talking picture sequences and sound reproduction in a good part of the acting.

The idea which the director had for enhancing the vivid action of the play crystallized into material form after several conferences with representatives of Electrical Research Products, the company which distributes the Western Electric Sound System. ERPI's staff of engineers helped work out details of a plan to fully develop Biberman's ideas and Audio-Cinema produced the seven talking picture sequences that will be used in the production.

### Much Additional Equipment

To assure adequate reproduction ERPI has installed three separate reproducers in the theatre, all electrically interlocked so that sounds and scenes reproduced by each will synchronize perfectly with one another and with the action on the stage. Two of the projectors are mounted on the turntables so that their projected sounds may be merged into each other producing an entirely new effect for talkies.

Seventeen loud speakers are used, eleven of them back stage—three of which are used entirely for sound ef-

fects—and two in the proscenium arch and four in the auditorium. The effect that these speakers are expected to introduce is already being referred to as a complete innovation even for talking pictures a "third dimension" in sound.

## Checking Amplifier Troubles

If all the vacuum tubes show low plate current, the source of plate voltage is likely to be low; if a battery is used, its internal resistance may be unduly high. This situation is usually found only in old batteries. If the plate current in only one of the vacuum tubes is below the limits, it is likely to be making poor contact with one of the springs in the socket. The contact pins on the base of the tube should be cleaned and also the contact springs on the socket should be cleaned and, if necessary, bent a trifle to increase the pressure.

When the plate current of a tube exceeds the limits, the grid terminal is making poor contact with the socket spring. If the plate current of the second and third stages are high, the voltage of the grid batteries may be too low. If, upon a check-up, it is found that the grid voltage is correct, replace the tube or tubes.

### Filaments in Series

If the filament of one of the 200-D tubes burns out, then both tubes will be extinguished, owing to the fact that their filaments are wired in series. If all the filaments are extinguished, it indicates that the 3-amp. fuse has blown.

If the amplifier ceases to deliver

## HIGHER SENSITIVITY and longer life!



The high sensitivity of Photoelectric Cells brings greater current output with less amplification. This results in clearer, better defined sound with "static" or stray current noises largely eliminated. Visitrons give reliable non-fluctuating service. No need for adjustments to compensate decreasing sensitivity. No frequent service calls. Visitron Photoelectric Cells are guaranteed for six months against defects in materials and workmanship. Their average term of life is well over a year. Your nearest Branch of National Theatre Supply Company will provide you with the correct Type for use with any sound equipment.



A TYPE FOR EVERY THEATRE

PHOTOELECTRIC CELLS  
**VISITRON**

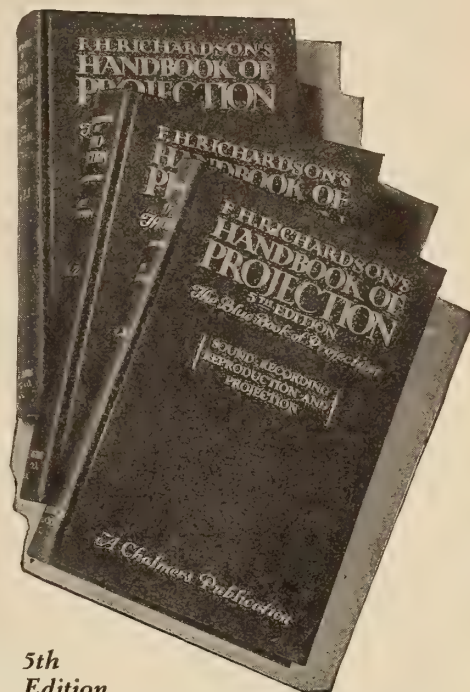
REG. TRADE MARK

GM LABORATORIES INC

1803 GRACE ST.

CHICAGO, ILL.

## THE BEST SELLER



5th Edition

## HANDBOOK OF PROJECTION

By F. H. Richardson

Back in 1910 Mr. Richardson wrote the first Handbook of Projection. It was a sell out. Second, third and fourth editions, each bigger and more successful have followed. The present fifth edition in three separate volumes, illustrated above, is the culmination of years of intensive effort.

Richardson is no swivel chair author. He knows the problems of the field—meets the men on their own ground. His books reflect a practical knowledge of just what information is needed. Recently he completed a 17,000 mile trip through the U. S. and Canada in the interests of projection.

### CONTENTS

Volumes I and II are devoted entirely to the general subject of projection and everything related to it. Volume III deals exclusively with sound projection. All three volumes are profusely illustrated and contain over 1,400 pages of projection information written so you can understand it clearly. Each volume contains Richardson's famous question and answer index giving immediate access to hundreds of different problems.

These are the books which are being used by projectionists and theatre managers all over the world to secure improved results. Send for this finest of projection libraries today.

### USE COUPON TO ORDER

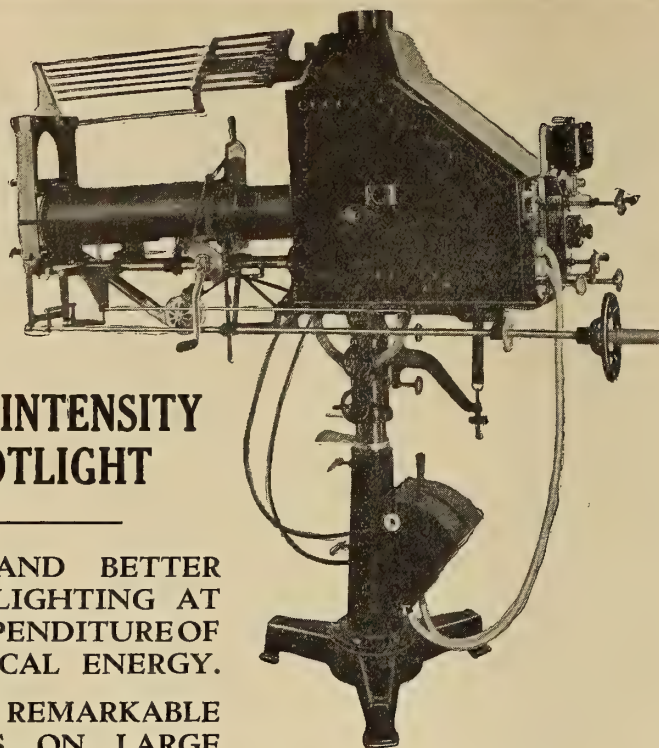
CHALMERS PUB. CO. (M)  
516 Fifth Avenue, New York, N. Y.

Enclosed find (check) (money order) for \$10.25. Send Richardson's 3 volume Handbook of Projection to .....

### WINNIPEG, CANADA

J. M. RICE & CO., J. M. Rice, Prop. Leading equipment dealers in all kinds of projection room equipment facilities. Representatives of leading equipment manufacturers of the United States and Canada. All our merchandise guaranteed for performance and stability. Whatever you want we will supply it.





## HIGH INTENSITY SPOTLIGHT

MORE AND BETTER  
STAGE LIGHTING AT  
LESSEXPENDITURE OF  
ELECTRICAL ENERGY.

MOST REMARKABLE  
RESULTS ON LARGE  
STAGE SETS.

**HALL & CONNOLLY, INC.**

24 Van Dam St.

New York, N. Y.



any output, although it is receiving input and the filaments all are lighted, the .25-amp. fuse has probably blown or the source of plate current supply has been ruptured. If it is found that the fuse has blown, replace it; if it blows a second time, there is some other trouble which will require careful checking. Under these circumstances it is not unlikely that a short-circuit of the socket between the grid and the plate will be found. This can be remedied by taking out the defective socket and replacing the washer.

Noises in the output of the amplifier are likely to be caused by poor tube contacts, defective ground, inadequate shielding of the input, or, perhaps, an unsteadiness of the power supply.

### Overload on Amplifier

If the plate circuit of the third stage fluctuates very noticeably, it is an indication that the amplifier is being overloaded. This makes the output quality very poor. The amplification should be reduced by the gain control until the fluctuation disappears. It may happen that even when the gain is reduced as much as possible, overloading still persists. This indicates that the input must then be reduced by inserting resistance in the input circuit. Poor quality may also be due to low grid batteries, poor tube contacts, or defective tubes.

A form of scratching or ringing noise may develop in the amplifier. This is due to a noisy tube, which must be replaced. If the noise is experienced when operating the gain control, it indicates that the control needs cleaning.

### Short Circuits

If the amplifier does not function properly and none of the previously named sources of trouble are found to be the cause, it is quite possible that an open circuit, a short circuit, or loose connections are responsible. The best procedure then is to follow the circuit on schematic and test along the line, and listen with a pair of high resistance head receivers. This will help to localize the trouble.

## Your Preference, Please!

THE editors of MOTION PICTURE PROJECTIONIST solicit your aid to the end that this publication may be of the maximum service to you. Every subscriber can do his bit to improve this service by using the space provided below to indicate his preference for special articles and other material in which he may be particularly interested.

Let us know your preference, please. All requests will receive attention in the order of their receipt, so act quickly. Use the blank below to tell us in just what subject you are particularly interested. Do it now!

Editor,  
M. P. PROJECTIONIST:

I am interested in the following subjects, on which I should like to see information in MOTION PICTURE PROJECTIONIST:

1. ....
2. ....
3. ....
4. ....

NAME .....

ADDRESS .....

### General News of Industry

#### Cameramen's Salary Tax

A tax of 1% of their salaries to go toward the operating fund in their organization is levied against each cameraman, now employed, belonging to the International Photographers of the Motion Picture Industries, Local 644. The tax is effective as of March 1.

At the same general meeting of the local industrial and commercial productions were put on the same terms as legitimate picture conditions. This



means that every cameraman doing such work must have an assistant.

#### "An Emergency Measure"

In a letter to members not present at the session the reason for the 1% levy was given by O. V. Johnson, business representative, as: "This is an emergency measure and necessary on account of the increased operating costs of the union."

#### See Television 5 Years Away

Show business need not be concerned about television for at least another three years. If it comes out in practical fashion then it will be due to some scientific miracle not yet manifesting itself. Five years is the quickest time its materialization normally can be expected.

This comes from Radio officials, who say that were air and wire television transmitted with perfect clarity today it would be impracticable to debut generally one or the other.

#### Wired Television Too Costly

That wired television costs 10 times the money and requires as many times the present number of wires, and that broadcasting necessitates 10 times the air wave required to shoot out sound, place television as much in a class for the study of specialists in economics as scientists.

Until television generally can be simplified; until the costs can be reduced and the equipment reduced in bulk there is little chance of air or wire pictures ever reaching the home of the average public institution. The men high up regard claimants of early television as either unfamiliar with the facts or just enthusiastic.

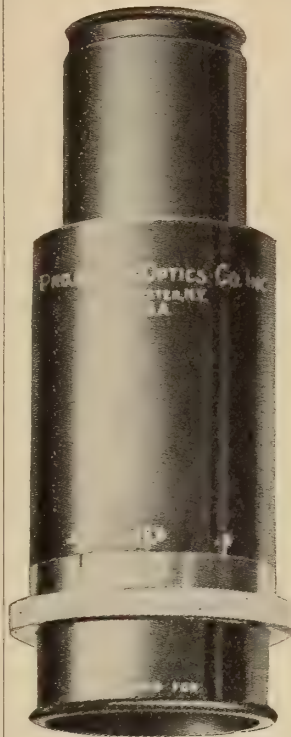
#### Warning on Hollywood Work

At a recent meeting of the executive committee of the Academy of Motion Picture Arts & Sciences it was decided that some effort should be made to stop the influx of young men and women who come to Hollywood for the purpose of entering motion pictures. A false impression has been spread over the country that golden opportunities lie within the grasp of any fairly talented or reasonably good looking young person who can manage to get to this city.

"The fact is," say Academy officials, "that there is a crying need for a reduction in the number of actors and actresses already here; players of training and ability who are literally in dire want and for whom there is no work.

#### A Job Every Three Years

"Of the seventeen thousand five hundred (17,500), extras registered at the Central Casting Bureau during 1930, only eight hundred thirty-three (833), averaged one day's work per week and only ninety-five (95), worked as much as three days per week. Of



## SUPER-LITE LENSES

WISELY CHOSEN BY  
AMERICA'S BEST THEATRES

#### New Bifocal Super-Lite Lens

An adjustable focus lens with a wide range of foci for both silent and sound film.

#### Series III. Super-Lite Lens

Standard full Half-Size lens furnished in short focus as low as 4" E. F. and up to 10" E. F.

#### Series IV. Super-Lite Lens

Full 3" diameter lens to meet the demand for more light for longer throws. 6" E. F. to 10" E. F.

*Quality Guaranteed*

**PROJECTION OPTICS CO., INC.**

330 Lyell Avenue

ROCHESTER, N. Y.

U. S. A.

## CARBONS COST MONEY



### BEST CARBON SAVER

*for Low Intensity Arcs*

Permits projectionist to get at least one more reel from each set of stubs. Made in 7, 8, 9, 10, 12 and 13 mm. sizes.

*\$2.50 each at your dealer.*

**BEST DEVICES CO.**

200 FILM BUILDING

CLEVELAND, OHIO

**KEEP all your COPIES of**

**MOTION PICTURE PROJECTIONIST**

**AS A REFERENCE FOR CURRENT**

**AND FUTURE NEEDS—PRE-**

**SERVE THEM IN A**

**BINDER**

**\$3<sup>00</sup>**  
**each**

**BINDERS**

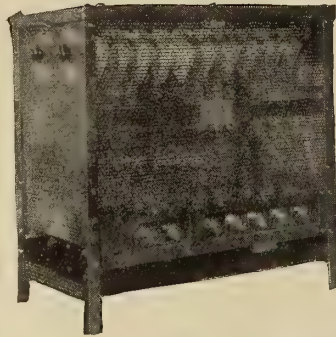
**GOOD SOLID  
IMITATION LEATHER  
—GET ONE**

**ORDER FROM THE MOTION  
PICTURE PROJECTIONIST**



# Hoffmann-Soons

## PERFECTION



### LOOK AT YOUR LOSSES

Sound screen and color are the hijackers of light rays—taking, with other losses, approximately 80% of your amperages.

In hundreds, if not thousands, of theatres, crowded attendance is thinning out. Profits shrinking. Because pictures are projected with insufficient light.

Swell your box office receipts with the remedy—Perfection Multiple Coil Rheostats, the world's best. Let us mail our new catalog telling all about it.

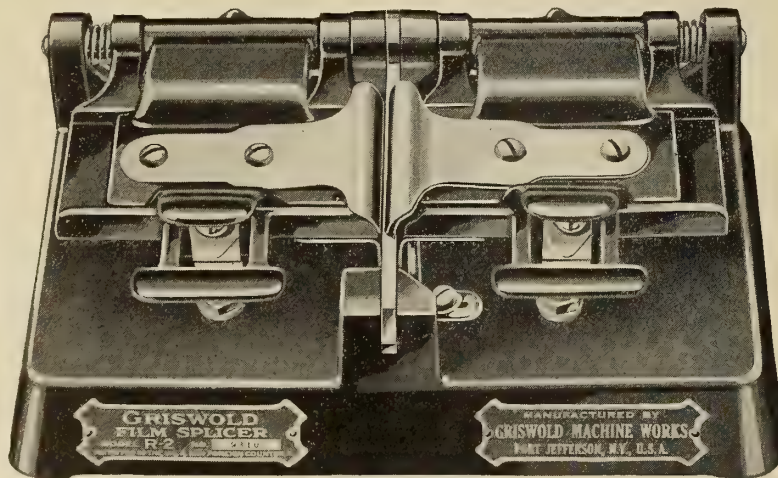
### THE ONLY UNION MADE RHEOSTAT

*Sold by Sam Kaplan, and National Theatre Supply Co., New York, and by your dealer.*

### HOFFMANN-SOONS

Electrical and Engineering Corporation  
387 First Avenue, Mfg. Division, New York  
*Contracting Electrical Engineers—Moving Picture Theatre Electrical Specialists*

# RHEOSTATS



15,000 Griswold Film Splicers are in constant use daily in theatres throughout the World. The standard film splicer for efficiency, durability and economy.

## GRISWOLD MACHINE WORKS

Port Jefferson, L. I.

New York

## How to Get a Patent

*(Continued from page 32)*

rected to a practical or "useful" function.

Now, having found out just what a patent is, let us next consider, generally, the kind that fail and those that succeed.

In the beginning, it must be admitted that the majority of patents issued to inventors, week in and week out, do not return to them even the cost of taking out these patents, not to mention the time and expense of developing the ideas to the point of filing the applications in Washington. There are many reasons for this unfortunate condition, some of which it is the purpose of this series of articles to explain, and to suggest means of correcting or largely eliminating. Other reasons exist which cannot be removed, and so they will be clearly pointed out, in the hope that many of these useless patents may in the future be eliminated.

In spite of the many patent failures, it is nevertheless true that for every ten of them that result in a loss to the inventor, there is one, or possibly two, that returns a profit so great as to many times wipe out the combined loss from the failures, and leave a handsome surplus besides.

Newspaper accounts frequently attest to the more sensational of these successes. Only recently there was the report of a check for a million dollars having been drawn in favor of a Russian immigrant boy for his patent rights on an automatic photograph apparatus. A few years ago, Major Armstrong, who invented the regenerative circuit for radio receivers, is said to have received for his patent rights a half million dollars from several large electrical companies.

In this writer's more recent personal experience, one inventor of a non-set automatic stop for phonographs was paid \$125,000 in royalties by one large phonograph company, in less than three years, and for rights secondary to their own. During a recent investigation of the alien-owned patents taken over by the government in the name of the Chemical Foundation, it was revealed that a large camera company had long been paying \$100,000 a month in royalties for the use of German-owned patents.

These only typify a few of the many instances; for there are thousands of cases where the cash rewards from patented inventions have meant financial independence for their inventors and promoters.

But the inventor who seeks to profit under the patent laws must know *what to invent* and also *what not to invent*. This is a very large question, but a little general advice will prove of value.

*(To be continued)*



## Function of the Skin

(Continued from page 26)

its origin in the ingestion of a harmful substance such as arsenic, or one of the coal tar group. Attention is directed to the fact that workers exposed to crude oil or some of the anthracene derivatives, may have an epithelioma, which may pass unnoticed, as has come to my attention a number of times.

### Faulty Personal Hygiene

Cancer is a pertinent subject at the present time, and it may be well to quote some experimental work carried on by C. C. and M. C. Tworts of England. In a classification of four thousand experimental oil and tar, skin tumors of mice, 29,100 animals were experimented on. Synthetic tars produced, 1086 benign, and 1281 malignant tumors. Shale oils produced 997 benign, and 307 malignant tumors.

In all cases of skin diseases of the worker, it is advisable to inquire deeply as to the cause. In my experience, a large number of the severe dermatitis found, are due to faulty personal hygiene, for as a rule, the primary slight irritation is given scant attention, it is not until a papular and vesicular lesion has developed, or when a, so-called, eczema results, that medical advice is sought. By that time it presents a case difficult to diagnose, or determine the exciting cause accurately.

### Effect of Radiant

That light, or radiant energy, may cause skin lesions cannot be denied, it has been demonstrated by the action of the sun's rays, the effect of radium and roentgen rays. If in doubt, try to work with a small table light equipped with a reflector, placed about a foot away, and focused continually on the hands occupied with the job. It has been demonstrated that radiant energy increases the temperature of the skin, and this rise, in some cases, is a factor in allergy and asthma.

The effect of extreme cold upon the skin is well known, but in many industries and processes where low temperature are necessarily maintained, scant attention is given to the relation of this factor, to subsequent skin lesions, or to the institution of protective measures

### Irritant Solids or Liquids

Handling of solids or liquids possessing irritant or toxic qualities is undoubtedly responsible for many of the skin lesions, both directly, through contact, and indirectly, through systematic changes.

Our greatest concern is with dusts, inorganic, and organic, which possess

decided harmful properties, due to the fact that the exposure is to small quantities over a long period of time, and the individual seeks no medical aid until there is present, a secondary involvement of the tissues, or sequelae. Not infrequently the affected person has had so many occupa-

tions, that the original hazard has been lost to sight. In many instances the patient or employer possesses no knowledge of the substances to which the worker has been exposed. All this has an important bearing on the questions of prevention and compensation.

## By Test Proven Best!



\$9.00  
Each

Imagine! Now on their second year of giving satisfactory service to Hi-Lo lamp users everywhere from Coast to Coast. Surely there must be a reason for this preference for the

### GEM CONTACT JAW

Designed right, made right, and priced right.

Order a Spare Now!

FOGELBERG ENGINEERING CO.

128 S. Clinton St.

Chicago, Ill.

Sold by Reliable Independent Dealers Everywhere

## SOUND REELS

For Perfect Projection

—All Sizes—

ALL-WELDED TYPE  
One Unit

DEMOUNTABLE TYPE  
Each side one unit

LASTING DURABILITY  
Bright Cadmium Plated

ALL PARTS  
REPLACEABLE

UNIVERSAL ELECTRIC  
9-16 Thirty-seventh Ave.,

WELDING COMPANY  
Long Island City, N. Y.



Give This to Your Friend—Have Him Fill It in and Mail to us at Once

The Motion Picture Projectionist  
45 West 45th Street, New York City

Gentlemen:

Enclosed please find \$2.00 for which enter my subscription for one year (12 issues) starting with ..... issue. (Two years, \$3.00.)

Name .....

Street ..... State .....

City ..... Local No. ....



the seven thousand (7,000), actors and actresses registered in the Call Bureau only six or seven were placed each day. If work could be equally distributed this would mean each actor of the Call Bureau could be furnished one part every three years.

"When the industry is so hard put to it to care for its own tried and experienced players it is sheer suicide for youngsters to try to break in. It would help the situation if the press of the country would aid in spreading a picture of true conditions in the profession. Too much emphasis has been placed on the fortunate few who are in great demand and too little on the many thousands of experienced players who cannot make both ends meet.

#### No Place for Inexperienced

"Less than a thousand actors are doing most of the work. A youngster, to get a chance, must pass the other six thousand (6,000), professional and registered actors, and in addition must compete with the thousands of young men and young women all over America and even in foreign countries who have the ambition for a motion picture career. The lucky break happens frequently in fiction; almost never in the studio. To the average casting director it looks as if the audience all wanted to be actors and the actors were forced to be audience. Something must be done to impress the young people of the country with the fact that we do not need them in Hollywood. The oversupply of applicants for positions in the motion picture profession exists in all departments of production and the situation is relatively acute."

#### Lynchburg, Va., Strike Ends

With the coming of Warners to Lynchburg as owners of the Trenton theatre the last chapter has been written in a projectionists' strike begun in September.

Local declared a walkout against the Trenton, along with Casey's three houses. When Publix took over the latter group the operators signed a contract for higher wages and better working conditions, but maintaining their strike against the Trenton.

When the Warner deal for the Trenton neared a close Matt Glasser, W. B. representative, arranged for the union projectionists to return.

#### Radio Musicians Prosperous

While musicians and musicians' organizations in general are fighting the mechanical age in music, a select few are praying for it to stick. These are the radio musicians employed by the networks, but mainly the men at the NBC studios in New York.

Some of the steadily employed NBC instrumentalists are grossing as high

as \$700 and \$800 a week. Any number seldom saw more than the scale salary in theatres and other jobs before radio arrived.

#### On Several Programs Daily

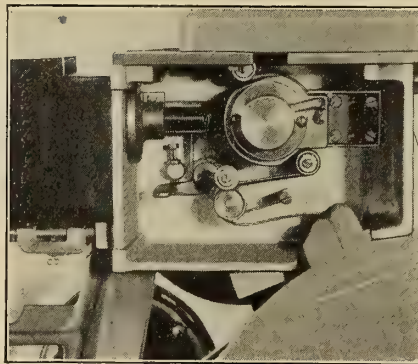
Several of the union boys at NBC are on so many programs in a day and so close together, they have to rush from one broadcast room to another in a hurry, making the jump in time to get in on the introduction.

A common sight at the NBC is to see a violinist conducting an orchestral presentment one moment and 15 minutes later see the same fellow buried deep in the fiddle section of another musical program. The chief distinction for the NBC musicians is top money.

#### Syncrofilm Heads Now Ready for Motiograph

Announcement has been made by the Weber Machine Company that it has adapted its Syncrofilm sound head for Motiograph projectors. This will come as welcome news to those exhibitors and projectionists using Motiograph projectors who have long desired to avail themselves of the Syncrofilm sound head.

Latest reports show that more than 1,200 Syncrofilm sound heads are in



Syncrofilm Head on Motiograph

constant daily use in this country and in Canada, and that they are rendering excellent service. Precision workmanship is the claim of the Weber Machine Corp. for all Syncrofilm heads, and the record of service compiled by this equipment would seem to bear out this claim. Among the many features of the Syncrofilm sound head, in addition to precision work, are (1) elimination of all possible friction on the film, a rolling contact throughout being maintained; (2) a special patented optical system which delivers the maximum amount of light with the required area; (3) ball bearing rollers and all parts chromium and cadmium plated.

Syncrofilm sound heads are now available for Simplex, Motiograph, and Powers projectors.

#### Index of Advertisers

Bausch & Lomb Optical Co. ....	5
Best Devices Co. ....	43
Bioscope, The .....	40
Brenkert Lt. Projec. Co. ....	6
Canadian Theatre Supply Co. ....	39
Chalmers Publishing Co. ....	41
Eastman Kodak Co. ....	39
Enterprise Optical Mfg. Co., Back Cover	
Fish-Schurman Corp. ....	38
Fogelberg Engineering Co. ....	45
Forest Electrical Corp. ....	40
General Machine Co. ....	5
G-M Laboratories, Inc. ....	41
Griswold Machine Works. ....	44
Hall & Connolly, Inc. ....	42
Hertner Electric Co. ....	7
Hoffman & Soons, Inc. ....	44
Ilex Optical Co. ....	Front Cover
International Projector Corp. ....	9
Kaplan, Sam, Mfg. & Supp. Co. ...	2
Movie Supply Co. ....	40
National Carbon Co. ....	3
National Theatre Supply Co. ....	47
Projection Optics Co. ....	43
Rice, J. M., & Co. ....	41
Roth Bros. & Co. ....	4
Strong Electric Corp. ....	38
Technicolor, Inc. ....	10
Theatre Eng. Service Co. ....	8
Universal Elec. Welding Co. ....	45
Weber Machine Corp. ....	37
Western Electric Co. ....	13

#### ERPI Head Explains Decision

The decision of the Federal Court of Appeals that the Western Electric reproducing system in no way infringes the Ries patent, according to Mr. J. E. Otterson, president of the Electrical Research Products Inc., confirms that company's assurances to the motion picture industry as to the soundness of its patent position. Says Mr. Otterson:

"I have been asked by a number of people the significance of this decision in the patent litigation instigated by the General Talking Pictures Corporation and De Forest Phonofilm Incorporated against certain users of Western Electric equipment as this suit was defended by the Western Electric Company and Electrical Research Products Inc.

"The De Forest interests sued the Western Electric interests for infringement under four patents. The decision of the Circuit Court of Appeals just rendered, declares that Western Electric apparatus does not infringe these patents. This disposes of all patent litigation brought by the De Forest interests against the Western Electric interests in the United States."





This Stamp of Approval identifies manufacturers of reliable Projection Accessories. Look for it in their advertisements.



*THERE IS NO SUBSTITUTE FOR*

# RELIABILITY

It hasn't been so many years since "projection booth" equipment consisted of a projector, a rewinder and a bottle of film cement. The development of Motion Picture Projection as a specialized trade has changed the picture completely. Good projection no longer depends on a few major units of equipment. Sound pictures have made the careful selection of Projection Room Accessories a vital part of modern projection. An Exciter Lamp that fails, a Film Cleaner that leaves emulsion on the Sound-strip, a Photo-electric Cell of variable sensitivity . . . Such things as these can make the best projectionist in the world turn out poor pictures. Every projection accessory offered by any National Branch has proved its quality and dependability in actual test before it has gained admittance to distribution through National Service. The projectionist can have no better assurance of quality than this. It protects his own ability. The reliability of National Theatre Supply Company Accessories is something for which there is no substitute.

**NATIONAL THEATRE  
SUPPLY COMPANY**  
*Branches in all Principal Cities*



# MOTIOGRAPH DE LUXE COM- PLETE SOUND EQUIPMENT

PRICED FROM

**\$2500.00 to \$7500.00**

**MARVELOUS  
IMPROVEMENTS!**

We invite you to visit our factory  
to see, and listen to our

**MOTIOGRAPH DE LUXE SOUND  
PROJECTOR EQUIPMENT**

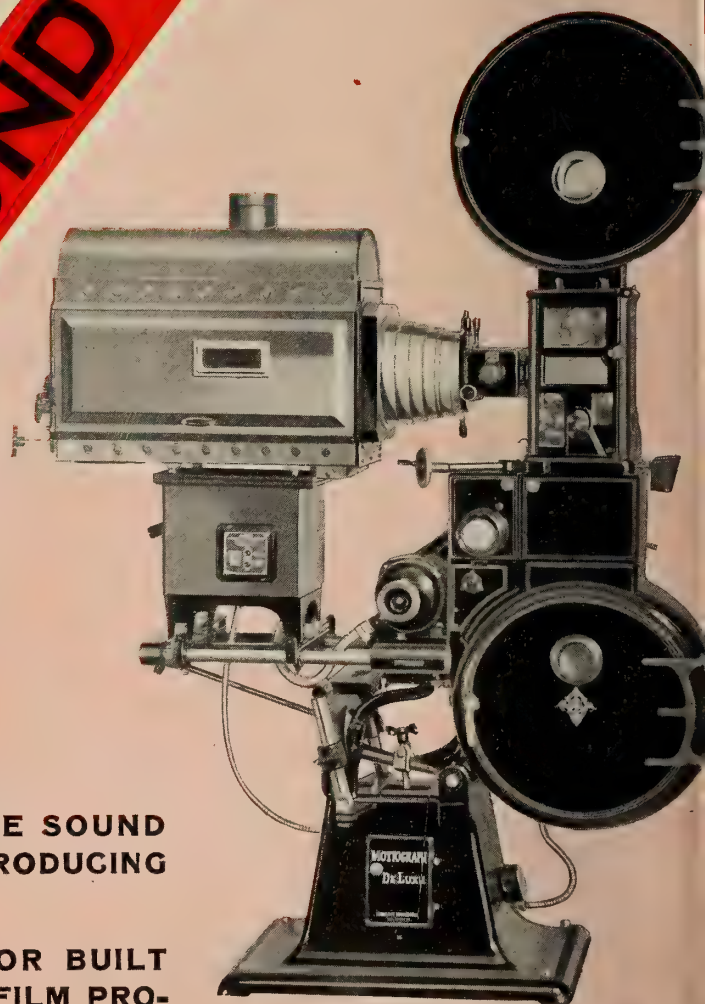
No batteries or charger used

No generator used

No fader used

No weekly service charge

**FULLY GUARANTEED**



MOTIOGRAPH DE LUXE SOUND  
PROJECTOR FOR REPRODUCING  
SOUND FROM FILM.

THE ONLY PROJECTOR BUILT  
PURELY FOR SOUND FILM PRO-  
JECTION.

WRITE FOR OUR BOOKLET OF FULL INFORMATION

**ENTERPRISE OPTICAL MANUFACTURING CO.**

564 W. RANDOLPH ST.

CHICAGO, ILL.



# MOTION PICTURE PROJECTIONIST

*(Fourth Year of Publication)*

## THE ILEX F:2.5

STANDARD ADJUSTABLE  
PROJECTION LENS

### SHORT FOCAL LENGTHS

A new era in screen presentation brings forth larger pictures and wider screens. "Grandeur" effects from 35mm. film are now possible for every theatre with ILEX, offering the finest short focal length lenses that the present day market affords. This is true because ILEX lenses are corrected for critical definition, maximum sharpness, brilliant illumination and flatness of field. Slop-over and incomplete covering of the screen are cared for by the exclusive ILEX adjustable feature.

For the projection equipment you use, ILEX lenses are the best . . . perfect in performance . . . faithful in service. We can furnish engineering data and interesting literature to cover your projection problems.

ILEX OPTICAL CO. ROCHESTER, N. Y.



FURNISHED IN A WIDE RANGE  
OF FOCAL LENGTHS  
2½" to 9"



OPTICAL PRODUCTS OF PRECISION

# ILEX OPTICAL CO.

INSIST UPON ILEX — THE LENS THAT PUTS PERFECTION IN PROJECTION

A Mancall  
Publication

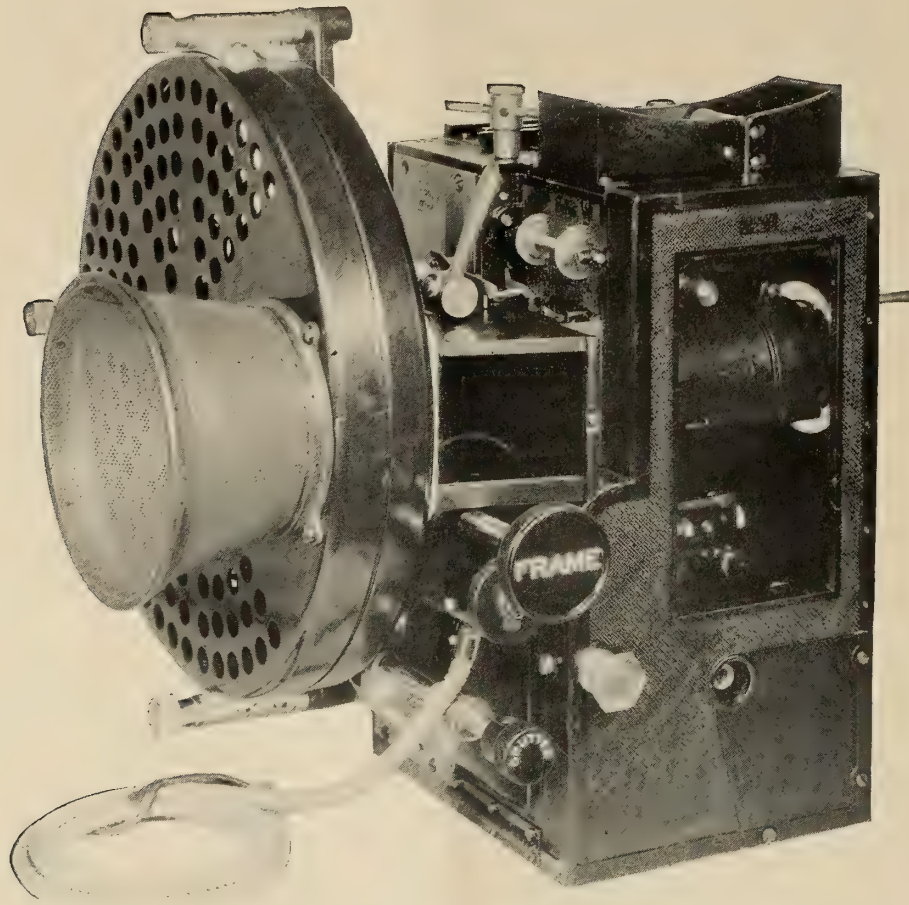
MAY, 1931

Vol. 4, No. 7  
25c. per copy  
\$2.00 per year



*Now Ready!*

# KAPLAN REAR SHUTTER



Can be Attached to Any Sure-Fit  
or Simplex Mechanism

*See your local dealer or write to us*

Sam Kaplan Manufacturing and Supply Company, Inc.  
729 Seventh Avenue :: New York City



# *Announcing—*

## Pre-Cratered 9 mm x 20"

# High Intensity Projector Carbons

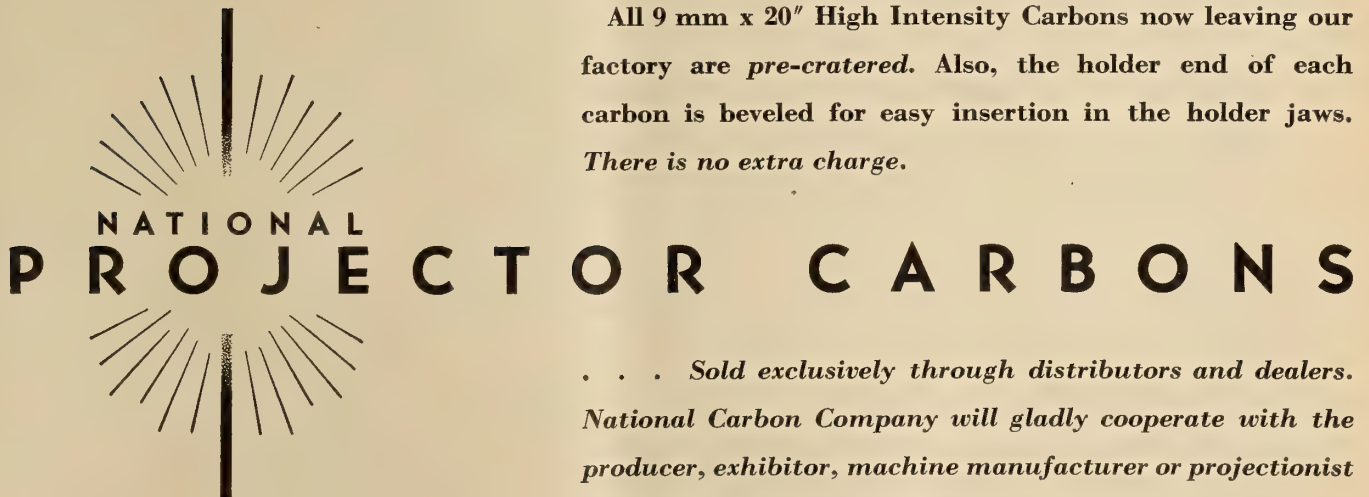
**A**NOTHER achievement of National Carbon research.

The history of National Projector Carbons is one of constant improvement. But the merit of each new idea is definitely proved, by exacting laboratory and service tests, before it is applied to the product.

The latest improvement is the *pre-cratering* of 9 mm x 20" National High Intensity Projector Carbons.

Exhaustive tests, both in the laboratory and in actual theatre projection, have shown that *pre-cratering* achieves two highly important results. It enables the arc to "burn in" much more quickly and smoothly. It results in clean burning when the arc is struck on a new carbon. The Projectionist will recognize the value of these features.

All 9 mm x 20" High Intensity Carbons now leaving our factory are *pre-cratered*. Also, the holder end of each carbon is beveled for easy insertion in the holder jaws. *There is no extra charge.*



. . . Sold exclusively through distributors and dealers. National Carbon Company will gladly cooperate with the producer, exhibitor, machine manufacturer or projectionist on any problem involving light.

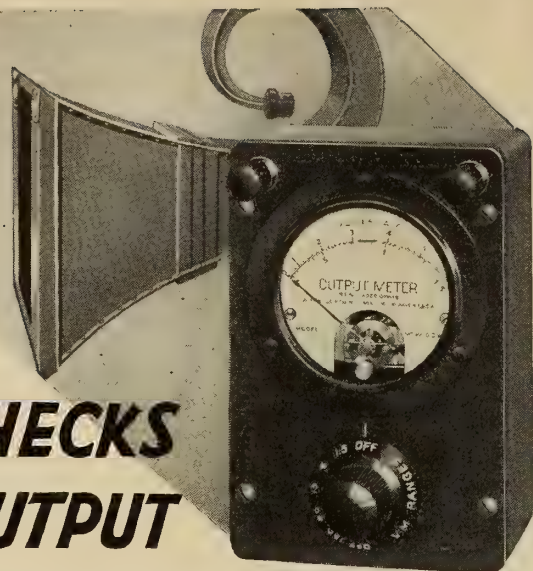
**NATIONAL CARBON COMPANY, INC.**

Carbon Sales Division      Cleveland, Ohio

Unit of Union Carbide  and Carbon Corporation

Branch Sales Offices:    New York    Pittsburgh    Chicago    San Francisco





## **CHECKS OUTPUT of SOUND APPARATUS WESTON *model* 571**

The portable Model 571 OUTPUT METER is an invaluable instrument to projectionists for checking sound apparatus.

It measures directly the voltage output of the sound apparatus at speakers or at any other point in the circuit. It is exceptionally useful for checking the relative volume of speakers; for determining the relative gain of tubes and for determining fader settings.

The Weston OUTPUT Meter, when used in the projection room, provides a visual indication of the sound level in the auditorium. In this way, the correct volume of sound can be dependably predetermined for different capacity audiences from previous meter readings taken with audiences of various sizes.

This method eliminates guess work and furnishes immediate indication of the least perceptible variation of the output of the sound apparatus. Thus the change over to the reserve circuit may be made without annoyance to the audience.

These uses alone make Weston Model 571 OUTPUT METER invaluable to modern high-quality sound projection. This instrument is moderately priced and will pay for itself in a short time.

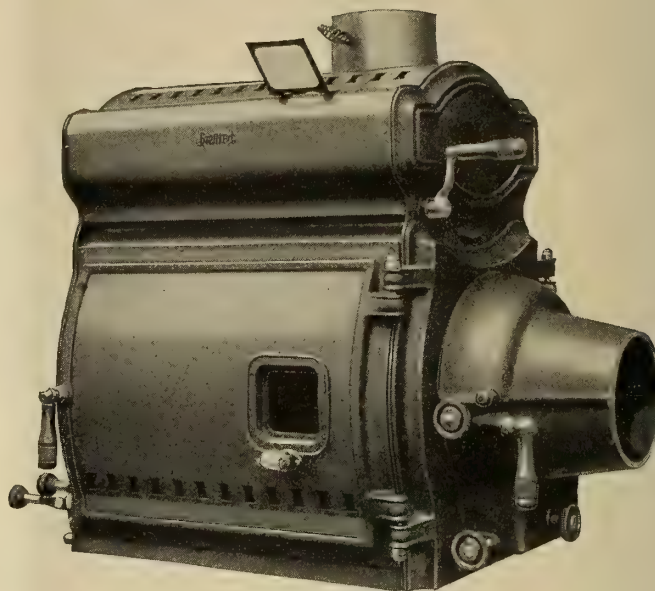
Model 571 consists of the Weston Model 301 A.C. Voltmeter of the Rectifier type with a constant impedance of 4,000 ohms. Its five ranges, 1.5/6/15/60/150 volts, selected by means of a dial switch, are brought out to two binding posts. The instrument is enclosed in a sturdy, black bakelite case. Size:  $5\frac{1}{2}$  x  $3\frac{3}{8}$  x  $2\frac{1}{8}$  inches. Weight: 1 pound, 10 ounces.

Write for Circular RR

**WESTON ELECTRICAL INSTRUMENT CORP.**  
617 Frelinghuysen Avenue Newark, N. J.

# *Better Screen Results with Brenkert*

## **SUPER HIGH INTENSITY PROJECTION LAMP**



### **A Few of the Many Installations Throughout the U. S. Includes:**

Strand Theatre, New York	Uptown Theatre, Cleveland
Strand Theatre, Brooklyn	Michigan Theatre, Detroit
Metropolitan Theatre, Baltimore	Capitol Theatre, Detroit
Mastbaum Theatre, Philadelphia	Riviera Theatre, Detroit
Warner Theatre, Erie, Pa.	Warner Theatre, Milwaukee
	Norshore Theatre, Chicago

Ask  
Any  
User



Write  
for  
Literature

CORRECT DESIGN—PRECISION CONSTRUCTION

### **BRENKERT LIGHT PROJECTION CO.**

Engineers & Manufacturers

ST. AUBIN AT EAST GRAND BLVD., DETROIT



# MOTION PICTURE PROJECTIONIST

May, 1931

Vol. 4, No. 7

JAMES J. FINN, Editor

Lester Isaac, *Efficiency*; J. H. Kurlander, *Light*; Thad Barrows, *Conservation*; J. E. Robin, *Equipment*; Samuel Wein, *Research*; R. H. McCullough, *Sound Projection*; Harry Rubin, *Improvement*; Victor Welman, *Personnel*; Sidney Burton, *Production*

Published monthly by Mancall Publishing Corp., 7 West 44th St., New York City. Subscription rates in U. S. and Canada: twenty-five cents per copy; two dollars per year; three dollars for two years. Add one dollar for foreign postage. Changes of address should be submitted three weeks in advance of publication date to insure receipt of current issue. Entered as second class matter Oct. 25, 1927, at Post Office, New York, N. Y., under the act of March 3, 1879. Additional entry at New Brunswick, New Jersey.

## Canadian Representative

H. N. Elliott, 203 Vaughan Road  
Toronto, Canada.

## Australian Representative

McGill's Agency  
179 and 218 Elizabeth St.  
Melbourne, Australia.

## Editorial & Advertising Office

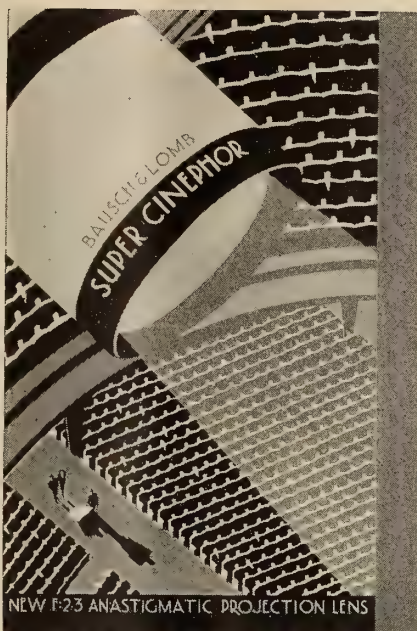
7 West 44th St.  
New York City.



## Television-Sound Program

Another milestone was passed in the rapid advance of radio broadcasting when, on Sunday evening, April 26, the radio audience tuned in on living pictures of performers being heard over the usual broadcast receiver. The program, lasting from 6 until 8.30 P. M. E.S.T., marked the inauguration of regular Television service tied in with regular sound broadcasting. The sight and synchronized sound signals covered metropolitan New York and a considerable portion of the surrounding area.

Both studios and Television transmitter are located in an office building at 655 Fifth Ave., New York. Microphones of that station were installed in the television studios. The performers faced the combined flying spot Television pick-up apparatus and the microphones, for the complete sight and sound broadcast. At the home end, the usual broadcast receiver was tuned to 1,180 kilocycles or 254 meters for the synchronized sound from WGBS, while the Television receiver was tuned to 2,035 kilocycles for the picture signals from W2XCR, thereby providing what really amounted to radio talkies.



## To Tell You About Modern Projection

This catalog gives complete information about the new Super Cinephor lens and

condenser system. This projection system is one of the most important developments in motion pictures. It gives better definition than ever before, especially on short focal lengths. It supplies more intense illumination and better distribution of light, due to the new condenser, and therefore gives a more nearly perfect projected image.

The new catalog is full of information of value to projectionists. You are entitled to a copy. Write for it today.

## BAUSCH & LOMB OPTICAL CO.

680 St. Paul Street

Rochester, N. Y.



# BAUSCH & LOMB

Makers of Orthogon Eyeglass Lenses for Better Vision

## IN WESTERN CANADA!

## CANADIAN THEATRE SUPPLY CO.

Authorized distributors for

**SIMPLEX—MOTIOGRAPH—POWERS—HOLMES**

and all theatre equipment of the leading manufacturers. Also, an extensive line of stage equipment.

**Complete Sound Picture Service!**

**306 Canada Building  
Winnipeg, Man., Canada**

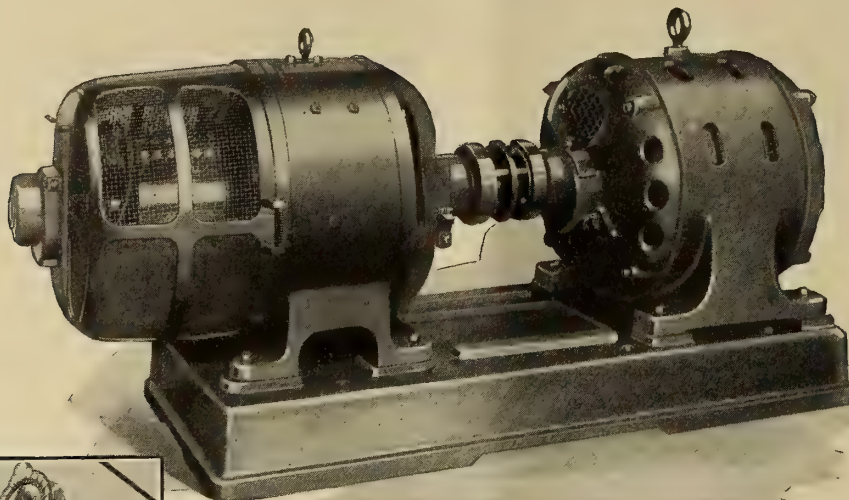
Alberta Representative

**M. L. ADAMSON**

9921—113th St., Edmonton, Alb., Canada



# THEY KEEP A-RUNNING



150/225 to 400/600 Ampere 4-Bearing Actodecotor



Paramount-Stapleton Theatre, Staten Island, N. Y., which recently opened. Roth Actodecotors as illustrated are used by "Publix" for their finest theatres.

## Always Dependable

Continuous dependability of operation is one of the most important of the many reasons why Roth Actodecotors are preferred for projection arc service... They supply steady direct current power, of the proper voltage, to the arcs—which results in brilliant screen illumination of uniform intensity, even during changeover... Any number of arcs can be carried within the ampere ratings of Roth Multiple Arc Type Actodecotors. The sizes range from 20 to 600 amperes... Furnished in 2- and 4-bearing types.

### ROTH BROTHERS AND CO.

*Division of Century Electric Company*

1400 W. Adams St.

Chicago, Ill.

*Distributors and Offices in all Principal Cities*

ACDC-4

DIRECT CURRENT  
MOTORS AND  
GENERATORS



MOTOR GENERA-  
TOR SETS AND RO-  
TARY CONVERTORS



# Elements of Magnetism and Electricity

By SIEGFRIED S. MEYERS†

## II

IN the last installment of this series we learned how Ohm's Law functioned in an electrical circuit. We also considered the electron, rather sketchily it is true, but in sufficient degree to give us a good foundation for future progress. Allied with the study of electricity is the subject of magnetism, which is so greatly dependent upon the laws of electricity. In fact, magnetism, when studied apart from electricity, is practically a dead subject. This article, therefore, will treat of magnetism with a view to subsequently linking it with electricity, so that we may lay the foundation for electromagnetism.

### The Lodestone

The history of magnetism dates backward many centuries. The magnetic compass used in sailing vessels was one of the earliest applications of the principles governing magnetism. The discovery of magnetism is accredited to a shepherd boy in Asia Minor who, while tending his flock, sat down to rest and placed his walking stick upon a nearby rock. Arising a short while later, he found that his shoes in some curious manner appeared to stick to the ground; he reached for his walking stick, and this too appeared to adhere to the ground.

Upon removing his stick from the stone and stepping away he observed the absence of such adhesive properties. He repeatedly stepped on and off the stone, and each time noticed the same adhesive effect. Finally, unable further to satisfy his curiosity on the spot, he put several of the stones into his bag and journeyed homeward.

When he reached home he brought out the stones and by a series of sim-

ple experiments produced some very curious effects. His first observation was that the stones exerted a strong attraction for one another, and could only be separated with difficulty. He found that when his walking stick was placed in the midst of the stones they tended to stick to its end. He then removed the iron tip on the stick and placed the stick next to the stones: and this time it exerted no attraction upon the stones. He repeated this experiment several times, and each time the effect was the same. The iron tip determined the reaction obtained.

Mystified by these strange reactions between the iron tip and the stones, the shepherd boy next removed his shoes and by placing them next to the stones observed that the iron nails which bound the sole to the shoe were attracted to these curious stones. Securing other stones, he repeated the experiments, but did not get the same results. His conclusion, logically, was that the first group of stones were unlike any others. Among other experiments that followed, was one in which he suspended a stone from the first group on a string and allowed it to swing freely. Curiously, this stone always assumed a definite position with respect to the earth: it always pointed North and South. This stone subsequently was used as a compass for ships, and it came to be known as the "lodestone," meaning "leading stone."

### The Artificial Magnet

The lodestone was the forerunner of our present-day bar-magnet and horseshoe magnet. Definition: A magnet is a piece of iron or steel which has been previously magnetized so that it has opposite poles at its ends and has the tendency to attract other pieces of iron or steel, or even other magnets. If a lodestone (which is a "natural magnet"), is rubbed on

a piece of iron or steel, there results an "artificial magnet."

This magnet would then behave in every respect like the lodestone. It would attract pieces of iron, when suspended, would point North and South, and would have the capacity for magnetizing other pieces of unmagnetized iron without losing any of its own magnetism. Hence we may conclude that all the iron in the world may be made magnetic, if so desired. A magnet is distinguished from a non-magnet because of the tendency of the former to point North and South when suspended; and it is for this reason that every magnet has ends marked North and South. The ends of a magnet are called the "poles", and it is in the ends that the strength of the magnet is greatest.

### Lines of Force

The earth is said to be a huge magnet, having a north and a south magnetic pole. These magnetic poles are not the same as the earth's geographic North and South poles. The magnetic north pole is located somewhere in the region of Hudson Bay, Canada.

Now, the earth, as an enormous natural magnet, has a very wide field of influence. Any lodestone or artificial magnet, when suspended from a string at any point on the earth, will tend to line itself up with the direction of the earth's magnetic north and south poles. It seems as though this huge magnet has an infinite number of invisible fibres extending from one pole to the other which draw all other magnets, with their respective imaginary fibres, toward them. This field of influence is commonly spoken of as "lines of force"; by definition, imaginary lines which emanate from the north pole of a magnet and return through the south pole. Consequently, any particular region surrounding a magnet is permeated with these magnetic lines of force. The entire region which is filled with these lines is spoken of as "the magnetic field."

These lines of force pass through all substances—like glass, paper, water, copper, benzine, wood, rubber, and the like. For example: let us consider a piece of iron which has been rubbed by a lodestone and is covered with a piece of paper. According to theory, a magnetic field surrounds this artificial magnet, and has the tendency to attract other pieces of iron which are brought near it. Consider that we take some iron filings, which are minute pieces of

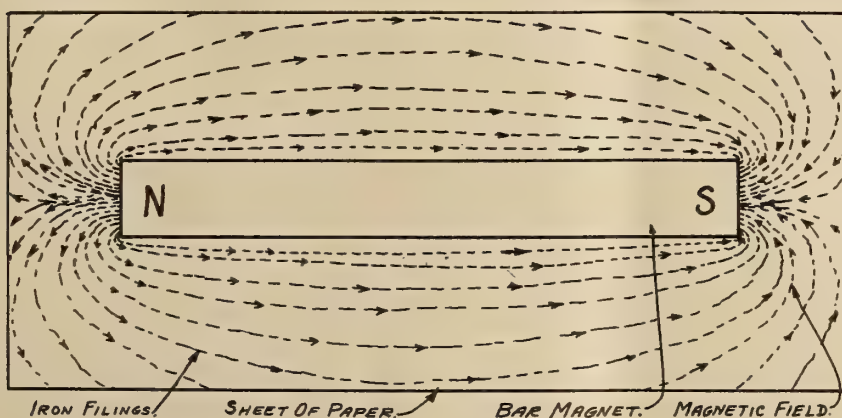


Fig. 1. The law of magnets

†Instructor of Physics, Stuyvesant High School, New York City.



iron, and sprinkle them over the paper immediately above the magnet. These filings would be attracted by the magnetic field in a manner shown in Fig. 1.

If we mounted a very thin length of magnetized iron or steel so that it could swing freely about a horizontal axis, we would have a compass needle. Let us bring a similar needle nearby, and both needles would turn to attract each other. But, curiously enough, we would note that these magnets would attract the same ends each time.

If we were to swing needle No. 1 about its axis, to see if needle No. 2 would attract its other end, we would find that needle No. 2 would automatically rotate about on its axis and offer its other end to needle No. 1. It seems that even the ends of such needles become mated, so that only a certain combination causes the two to attract. In order to determine which ends attract each other we need only to observe the ends of each needle which point to the earth's magnetic north pole, and mark them as such. Then, by placing them close together we would find that the north end of one magnet attracts the south end of the other, and conversely. Hence the law of magnets, namely, "opposite poles attract; like poles repel one another."

#### The Electromagnet

It is not very difficult to see why a piece of iron or steel may become a magnet, while a piece of copper or wood may not. Of course, no results of experiments are available which prove what occurs when a piece of iron is magnetized, but there exists a theory known as "Weber's Molecular Theory," which gives the most logical explanation of how a piece of magnetized iron or steel differs from an unmagnetized metal. We understand that all matter is composed of molecules which are in a state of balance with one another and exist as the building stones of the substance. In iron these molecules are not bound strongly to one another and can be easily shifted in their position.

If we were to take an artificial bar magnet and cut it in half, we would find that each half behaves exactly like the original whole, exhibiting the same properties of pointing North when suspended and being able to attract small iron filings or even small iron nails. If we should then again split one of these parts, each new part would still retain its identity as a magnet. If we were to continue dividing the magnet, we would find that each new smaller part would still be a magnet. If this process were continued to an infinitesimal limit, the resulting magnets would be said to be as small in size as the molecules themselves.

These molecules are not very

strongly bound to one another, and if a hammer were struck on a bar magnet the molecules would be jarred out of position and the metal would no longer behave as a magnet. But, if this disturbance should be followed by a gentle stroking of the bar by another bar magnet, each of these tiny molecules would tend to be attracted to the stroking magnet, and would turn themselves around to face the direction of the magnet in motion. After a few strokes, the metal would regain its magnetic properties, because all the molecules would then be lined up facing in one direction, with their north poles toward one end, and their south poles toward the other.

Electricity is closely linked with magnetism. If we place a compass needle near a wire carrying an electric current, we find that the needle assumes a position at right angles to the wire. The reason for this is that a wire carrying a current has a magnetic field surrounding it which tries to embrace the magnetic field of the compass.

Suppose we wrapped a turn of wire around a piece of unmagnetized iron,

#### Tentative S. M. P. E. Program

The tentative program for the Spring Meeting of the Society of Motion Picture Engineers to be held in Hollywood, May 25 to 29, just announced by Mr. W. C. Kunzmann, chairman of the convention committee, shows that every effort has been made to allow Eastern members to see as much of the studios as possible and also to permit the studio workers to attend meetings without interfering with their regular work.

Only one afternoon session will be devoted to papers, while the other three will be given over to trips to studios and other points of interest. Two technical meetings will be held at night so that studio workers may attend. The banquet will be held on Wednesday evening in the Blossom Room of the Hotel Roosevelt, the convention headquarters. All technical sessions will be held at the American Legion Auditorium.

Peter Mole has been appointed chairman of the arrangements committee and a reception committee of twenty, chiefly composed of West Coast people, will welcome Eastern delegates. Ten Los Angeles women, headed by Mrs. Donald MacKenzie, will provide entertainment for the women present. One of the features of the meeting will be an exhibit of new equipment developed in the last year and from the number of manufacturers who will display equipment, an exhibit of unusual interest is assured. Golfing privileges have been secured at the Lakeside Country Club.

and then passed an electric current through the wire by means of a storage battery. The magnetic field associated with the wire carrying the electric current would tend to magnetize the iron contained within. This would constitute a simple electromagnet. Suppose we then wound several turns of wire around the iron, and passed the same number of amperes of current through the coil, controlling the strength of this current by reading an ammeter which had a variable rheostat in series with it. In this case we should produce a more intense magnetic field. To verify the strength of these fields, assume that we dip the end of the iron into a box of iron tacks or filings, and compare the amounts picked up in each case. It is perfectly clear that filings would be picked up, because of the tendency of the electromagnet to magnetize the iron filings.

Now let us see what would happen if we should reduce the resistance of the rheostat, thereby observing an increase of current on the ammeter. Upon plunging our electromagnet into iron filings again, we would find that a greater amount would be picked up than before. Our conclusion from the foregoing would be that the strength of the electromagnet depends not only upon *how many turns of wire* there are but also upon *how many amperes of current* are flowing through these turns of wire.

The strength of an electromagnet is commonly referred to as the "ampere-turns." Therefore, the strongest electromagnet will be one that has many turns and is made of heavy wire which will withstand a great amount of current without over-heating.

#### The Horseshoe Magnet

If we bend the bar electro-magnet into the shape of a horseshoe, its strength is increased, for a very simple reason. From the law of magnets we learned that opposite poles attract one another. With the ordinary bar electromagnet it may be proved, by bringing a compass needle into close proximity, that opposite poles exist on either end. Now, when the electromagnet is bent around like a horseshoe these poles are brought just that much closer, thereby causing a *concentration* of lines of force, emanating from the north pole and returning through the south pole. As a result, the intervening space is concentrated with a strong magnetic field that is capable of exerting enough influence to pick up other pieces of iron or steel.

It is worthy of mention here that the use of an electromagnet depends upon its ability to lose its magnetic power when the electric current is shut off. If a piece of hard steel is placed in a coil of wire, and current



is passed through, this steel will become a permanent magnet capable of exerting magnetic properties, quite independent of the current. On the other hand, if a piece of soft iron be used, this metal by virtue of its molecular arrangement, is capable of becoming a magnet *only temporarily*, or, in other words, only during the passage of the electric current. For this reason we have the temporary electromagnet, which exhibits its magnetic properties only when we wish it to do so.

In conclusion we may say that magnetism without electricity would be as aimless and futile as an amplifier without vacuum tubes. Both subjects work hand in glove, so to speak, and

the one would be of little use without the other. In the next installment we shall proceed with the discussion of electricity, so that we may understand how to make electrical connections from the source to the apparatus which is going to use the electricity.

Electrical instruments will be discussed, as these are among the most important accessories in the field—the guide posts along the road to efficient work and conservation. An understanding of electrical symbols is absolutely necessary, also, so that the projectionist may be able to trace down any sort of trouble from a standard hook-up.

(To be continued)

## Trouble-Shooting Masterphone Equipment

By JOSEPH HURST

*Note: Much data has been made available on the subject of servicing and maintaining the more popular makes of sound picture reproducing equipment, but there has been a dearth of information on other and less popular makes of such equipments. The following data is concerned with the maintenance of Masterphone equipment, many models of which are in use in the Middle West.*  
—Editor.

**I**N SOME sections of the Western states you will find this equipment used almost exclusively. There is no regular service on this equipment and the projectionist is often helpless when some minor adjustment goes wrong. This article is written with the idea in mind to help the projectionist in these theaters to give as good sound as is heard in those theaters having regular service men.

One of the most frequent troubles encountered with Masterphone equipment is a barrel-like sound, which is especially noticeable with sound-on-disc reproduction. Almost invariably the poor sound in this case can be traced to the horn used for music. The tendency seems to be to leave this horn at full volume on the amplifier panel. The author has determined from a study of a number of theaters that this horn should be used for music only. On some scenes with a musical background, it is sometimes best to turn this horn on about one point. If in doubt, turn the horn off. This horn is used to accent the bass in the music and is good for that purpose only.

### Speaker Rattle

It is a good policy to listen closely to short musical sequences, as the voice speakers may rattle if left on alone for short pieces of music such as the introduction to the picture. A good test to determine if this is the source of the hollow sound is to run a reel of film through with the regular setting of the speakers; then to

run the same reel through with the music horn turned off and ask an observer-auditor which is the better. That is the acid test.

The photo-electric pick-up lens assembly is adjusted at the factory to give the best results. It should not be removed. Because of the ease with which it may be removed, many pro-

### New Television Flying Spot is Extremely Flexible

That the television art has progressed from the stereotyped close-ups of individuals to a wide variety of pictorial possibilities, is emphasized in the extreme flexibility of the latest type of flying spot equipment. In meeting the requirements of the budding television art, the flying spot is now capable of being aimed at any angle and in any direction, while a selection of lenses permits of a close-up, half length or long shot without changing the relative positions of subject or scanner.

The flying spot scanner consists of a powerful arc lamp in the usual housing, a scanner enclosed in a casing, and three lenses arranged in a turret mounting so that any one may be brought into position. The assembly is mounted on a barber chair's pedestal, permitting of swinging the beam in any direction, raising or lowering the beam, and, by means of additional mechanism, tilting the beam. Now installed in the Jenkins television studios, this flying spot scanner permits of picking up individuals or groups without trouble or loss of time, while the performers are permitted ample freedom of action for their presentations. The scanner operates on the present-day television standard of 60 lines at 20 pictures per second. The light reflected from the subject is picked up by two banks of photo-electric cells, placed on each side of the subject for the most effective lighting effects.

jectionists remove it for cleaning. The line of light that this lens gives is .001 inch in width. Just the slightest error in the setting of this lens will change the width of this line, and when it is realized that this width determines the pitch of the sound, the adjustment becomes important.

### Needle Contact With Disc

Because of the long arm on the pick-up used for sound-on-disc reproduction, the bearing upon which the arm rotates is likely to twist slightly. This twisting allows the end of the arm to drop down, and as a result the head of the pick-up rests down closer to the disc, thus causing the needle to rest at a small angle with the disc. The needle in this position cannot follow the high frequency notes and makes the bass notes sound even lower. If the voices on sound-on-disc reproduction seem to come from afar behind the screen the chances are that the pick-up has slipped and that the needle is too nearly parallel to the disc. Adjust the head so that the needle makes contact with the disc at an angle of about 60°.

If there is a hiss in the sound with disc reproduction, the probability is that the wrong type of needle is being used. The large diameter needles such as are commonly furnished by the film companies seem to be unsuited to the Masterphone pick-up. A regular phonograph needle of the half-tone or soft tone size will work very nicely. These needles will play the longest disc without any variation in the quality of the sound.

The Masterphone film head is very sensitive to light from an A. C. source. A powerful, unshaded light near the sound head is almost sure to result in an A. C. hum. If there is a lot of A. C. hum in your speakers, try shading the room lights and notice the difference.

### Fader Contract Arm

A scratching sound when the volume is changed is generally caused by too much tension on the contact arm in the fader. This can be cured by cleaning the points with carbon-tetra chloride, touching up the points with a trace of vaseline and adjusting the tension on the arm until it will move at all points with just the pressure of a finger.

In testing the 250 and 281 tubes, it is very easy to cause the tube to arc from the jack to the ground through the frame of the amplifier. This is likely to result in a failure of sound. If the tubes are still lighted and the sound can just barely be heard, it is probable that the speaker field fuses have blown. Test the fuses first, and then if you have no sound, it is likely that the plate on the tube being tested has been damaged. The speaker field fuses will generally blow first, however.



# Dynamic Cone Type Loudspeakers (RCA)

*Prepared by Engineering Department, RCA Photophone, Inc.*

Copyright 1930, by RCA Photophone, Inc.

**A** LOUDSPEAKER must be capable of setting up vibrations in the surrounding air which will range in frequency from about fifty cycles to six- or seven thousand per second, if natural reproduction is to be obtained. The air can only be set into vibration if some solid object is moved in it, thus causing these movements to be transmitted to the air. Therefore, the function of a reproducer is to set a body which is in contact with the surrounding air into rapid vibration so that its vibrations correspond at all times to the frequency of the original sound, as reproduced electrically by the amplifier.

Since it is impracticable to set a heavy object into vibration over the necessary wide range of frequencies, the vibrating element of the reproducer must be light in weight so that it follows faithfully all vibrations of the electrical impulses from the amplifier.

To produce the desired volume of sound, the vibrating mechanism must have a large surface, because the distance through which it moves is limited, and in addition, the driving mechanism for the reproducers must be capable of changing the electrical sound current into mechanical force without introducing an appreciable variation or distortion. That is, the driving force produced must be many times greater than the resisting forces tending to hold the movable parts in place.

The ideal mechanism for a faithful reproducer (loudspeaker), will consist of a very light weight piston

which moves as a whole. A coned shaped contrivance, as used in loudspeakers, answers the purpose admirably because it can be made both light and rigid.

## Constructional Details

RCA Photophone loudspeaker units are of the dynamic cone type, and are constructed to conform to the above general requirements. They consist essentially of two main parts: an iron housing, or "pot," which is magnetized by a field winding, and a movable cone, on which is mounted a "voice coil." The magnetic field is produced by a powerful electro-magnet made up of a large coil of wire wound on an iron core and enclosed in the iron housing in such a way that the housing itself is a part of the electro-magnet circuit. The purpose of this is to bring the two magnetic poles very close to each other. A study of Fig. 1 will show how this is accomplished.

The left end of the core is one pole, while the other pole is the left end of the iron housing surrounding the end of the core. Between them is located the voice coil, a sectional view of which is shown. By bringing the poles together in this manner the lines of force from one pole to the other, when the field coil is energized, are concentrated in a very small area.

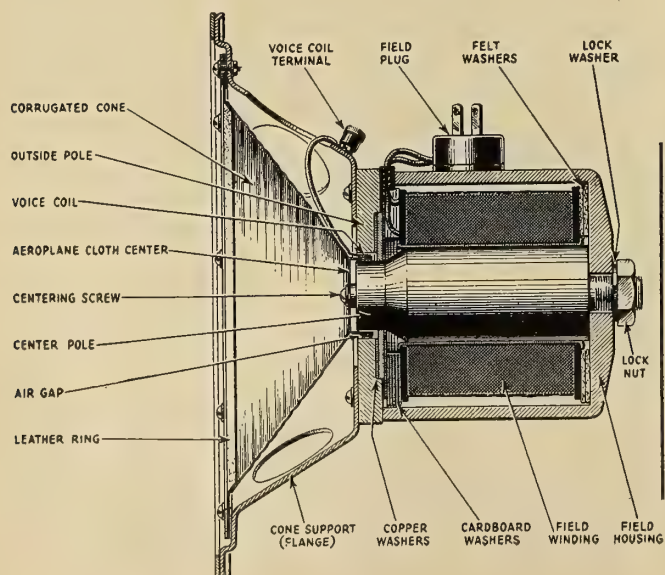
The cone is about eight inches in diameter at its outside edge, or mouth, and is made of heavy paper impregnated with a moisture-resisting compound. It is corrugated in concentric rings to improve the quality of reproduction. At the top, or apex, of the cone is placed a cylindrical fibre

ring about an inch in diameter and one-quarter inch wide, cemented to the paper of the cone. On this is wound the "voice coil," a small coil of fine wire which is the end of the circuit carrying the amplifier output.

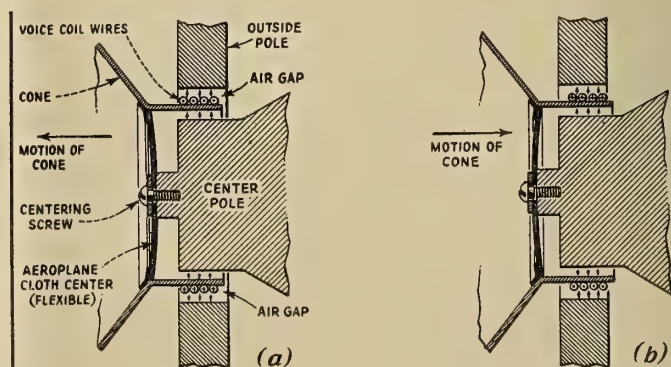
This ring, with the coil on it, is centered in a position in the air gap between the two poles of the field. It is held in place by a screw passing through the center of a piece of "aeroplane cloth" stretched over the end of the fibre ring and at that end cemented to the cone. The monitor speaker, however, uses a thin piece of perforated fibre instead of aeroplane cloth. The outer edge of the cone is cemented to a very light, thin, flexible ring of leather, which in turn is secured to an iron ring flange rigidly supported on the field housing. When supported in this way the cone is free to move in one plane, along its axis, due to the flexibility of the aeroplane cloth and leather ring supporting the cone. This means that the voice coil may move in and out along the air gap.

The moving coil has been carefully centered in the air gap so that no part of it may touch either pole piece. This setting has been clamped by the centering screw. If the coil should touch either of the pole pieces at any time when the speaker is operating, the movement of the cone would be interrupted and distortion would result. Dirt in this recess would cause the same trouble. The speaker is protected with cloth screens to prevent dirt from entering, and these screens should not be removed. Front and rear views of this unit are shown in Fig. 2.

The dynamic speaker used by RCA Photophone reproduces all frequencies in the audible range very faithfully. The tonal characteristics are extraordinarily natural. It is a superior mechanical achievement and a fine-



**Fig. 1 (left):**  
Construction of  
dynamic cone re-  
producer



↑↑ MAGNETIC LINES OF FORCE    ⊙ CURRENT COMING OUT    ⊙ CURRENT GOING IN  
**Fig. 3. Operation of Dynamic Cone Reproducer**



ly adjusted instrument, and while the construction is rugged and strong, it should be handled on the stage, where such handling is necessary, with as much care as possible.

#### Operation of Dynamic Speaker

The dynamic loudspeaker operates on the same fundamental principles as those underlying the action of an electric motor. If a coil or winding carrying an electric current is placed in a magnetic field, this coil has a tendency to move in a direction at right angles to lines of force in the field, the amount of movement being proportional to the number of lines of force and the current in the coil. The direction of movement depends upon the direction of flow of both the lines of force and the current in the coil.

When alternating currents of various frequencies are sent into the voice coil of the dynamic reproducer the pulsations in one direction move the coil outward, and the pulsations in the other direction send the coil inward, since the lines of force from the magnet poles are always moving across the air gap in the same direction. This is true since the field is energized by direct current. Fig. 3 shows how this action takes place.

The arrows representing the lines of force always flow from the same pole, but the direction of current in the voice coil changes constantly. Fig. 3 (a) shows the current, and consequently the motion of the cone, in one direction, and (b) the other. This results in a rapid back-and-forth vibration of the voice coil, and the cone attached to it, in exact correspondence with the pulsations of the currents in the voice coil, which are the output of the amplifiers. The vibrations of the cone create sound waves which are a reproduction of the variations of electrical energy set up by the running of the disc or film recorded sound.

#### Purpose of Monitors

A loudspeaker is installed in each projection room for the purpose of affording the projectionist a means of following sound cues and to give some idea as to the continuity of the sound. It should be remembered, however, that due to the noise present in the projection room, no attempt can be made to judge quality or volume of stage reproduction by means of the monitor speaker. This should be left entirely to some one in the theatre auditorium, and his signals to the projection room should be depended on in all cases.

All monitors use a flat baffle board to separate the sound waves from the front and rear of the cone, and is essential for best reproduction. The baffle is made of an asbestos board composition in all types except one, in which case a metal casing serves as

a baffle. All monitors are mounted about six feet from the floor of the projection room and usually so they are best heard in the space between the projectors. The ideal location is on the end wall to the left of the projectionist when facing the front wall.

#### Phasing of Loudspeakers

It has been mentioned that the coil moves in a certain direction when both the field current and voice coil current are in given directions. It can therefore be seen that when more than one stage speaker is used, they must be matched so that all field coils are polarized the same, and all voice coils are "in phase." This means that their connections must be made so that at any instant the current in all the voice coils is in the same direction.

If any field or voice coil connections were reversed, so that two speakers were not in phase, one cone would be moving in while the other moved out when reacting to one particular current impulse. This would produce interference at the line of intersection of the sound beams from the two speakers, and a "dead spot" would result. The speakers are properly phased at the time of installation, and it is important that none of the connections are ever reversed.

#### Directional Baffles

All dynamic speakers, with the exception of projection room monitors, are used in conjunction with a directional baffle, which is a large funnel-shaped wooden form. This unit is six feet long, constructed of soft pine  $\frac{1}{4}$ " thick. The small end, where the dynamic speaker unit is fastened to it, is 10" square, and this expands until the other end is about 3 x 5 feet. Acoustic conditions in the average theatre are such that conditions are best met by the use of such a sound directing device.

These speakers are mounted in a

rack directly behind the screen and as close to it as is possible without actually touching it. All parts of the rack surrounding the reproducer unit and the baffle itself are covered with sound absorbing material. This material is also used to cover the back of the screen, except where the speaker openings are located. This effectively deadens all sound which might escape back stage, reflect off hard walls and thus through the proscenium opening to the auditorium. This makes sure that the only outlet for the sound is through the portions of the porous screen adjacent to the mouths of the speakers.

#### Location of Speakers

Anywhere from one to four speakers may be used in a theatre, and in some cases, more. The number and arrangement to be used in each particular case is worked out beforehand from the plans of the theatre in order to obtain the best distribution of sound. The speaker unit itself has an effective sound distribution over an area of 30 degrees on each side of the speaker axis horizontally, and 15 degrees each side of the axis vertically. When one speaker is used, it should be placed at the center, or slightly above the center, of the screen and close to it. The location of the loudspeakers directly behind the screen gives the best illusion—that is, the apparent effect of speech is such that the actors in the picture actually seem to be speaking from the stage.

The vertical angles of the speakers which cover the orchestra seats are adjusted so that the line representing the upper limit of the 15 degree vertical angle strikes just above the last row of seats. If the theatre has a balcony which is not too close to the speakers, the orchestra and balcony may be covered with one pair of speakers in the same horizontal plane. In this case the vertical angle of the

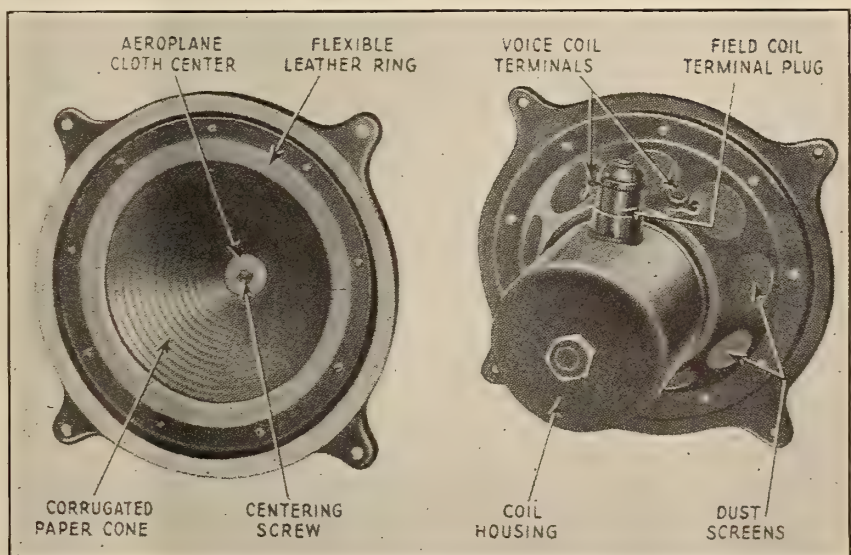


Fig. 2. Type PL-11 dynamic loudspeaker



speakers is adjusted to give approximately equal intensity and intelligibility in both the orchestra and the balcony.

When the balcony is too close to the speaker to be covered adequately in this manner, it is necessary to use separate speakers for orchestra and balcony. The speaker used to cover the orchestra is placed in the usual manner, below the center line of the screen. The balcony is covered by speakers placed just above the center of the screen, and adjusted vertically to properly cover the balcony without directing any sound into the orches-

tra. The number of speakers used depends upon the size of the balcony. Very high theatres which have a second balcony may require a third tier of speakers if the upper balcony is to be well covered. This is, however, an exceptional case.

The choice of location and number of loudspeakers to be used in a theatre depends upon so many variable factors that fixed rules for such choice cannot be laid down, but each theatre must be considered as an individual case and all variable factors must be considered separately and in combination.

## Eyestrain and Projection Work

By DAVID LEVINSON

WHEN the motion picture industry was in its infancy it was difficult to overcome the obstacles that made pictures "hard" on the eyes. Today, however, with the science of photography so far advanced, excessive ocular fatigue that comes from viewing a motion picture program indicates one of two things: either something is wrong with the eyes of the complainant or the picture as it was projected produced unnecessary eyestrain.

If the projectionist is reasonably sure that he is operating under the most favorable conditions, he can generally attribute to poor vision the dissatisfaction of patrons who invariably grumble about motion pictures hurting their eyes. For obvious reasons, ocular weaknesses will probably show up more strongly at a motion picture theatre than at most other places, and many people have discovered that they were in need of some correction for their eyes as a result of their experiences with motion pictures. Yet, it has seldom been shown that properly presented motion pictures are in any way injurious to the normal eye.

### Projectionist's Defective Vision

In a previous article in MOTION PICTURE PROJECTIONIST it was pointed out how visual defects possessed by the projectionist himself can seriously hamper him in his work. In the instance where a projectionist has an error of refraction, whether it be *hyperopia* (far-sightedness); *myopia* (near-sightedness); or *astigmatism* (unequal refraction), or combinations of *astigmatism* and either *hyperopia* or *myopia* or both, he is quite liable to lessen his efficiency and accuracy unless he has the trouble properly eliminated. So that he can focus his pictures and detect with alertness anything that may go amiss while he is on duty, the first step for the projectionist to take is to put his own eyes in shape.

The projectionist occasionally suffers as a result of conditions for

which he is not in the least responsible. At times he is given badly worn and poorly manufactured film that cannot be projected satisfactorily. His picture then appears on the screen with spots and streaks and the eyes of the audience are subjected to discomfort that will diminish the enjoyment of any picture, regardless of how interesting it might otherwise be.

### General Considerations

The general construction of the theatre, lighting arrangements, and the consideration given to the position of the screen in reference to the projection room and seats in the theatre, have much to do with quality of projection and, hence, determine in a large measure the amount of visual ease that will be afforded patrons.

First of all, the front row of seats should never be less than 20 feet from the screen. Otherwise, the eyes of a person sitting in the first row will be under constant tension. The screen should be so placed as to catch the projected pictures evenly and, at the same time, be far enough away from the projector to put into play most effectively the optical system employed in the machine. Neither too large a picture to be grotesque, nor too small a picture that makes the observer extend himself to make out details, is desirable.

The proper angle to which the screen should be tilted depends largely upon how the floor of the theatre is arranged, for this in turn governs the position of the seats. When visual limitations are abided by in setting up the projection system of a theatre, the screen should be angled so that a front row patron will not have to raise his head much more than 35 or 40 degrees to see the top of the picture. A minimum angular value of 20 or 25 degrees should prevail when movement of the eyes is horizontal. If visual limitations are altered, it naturally follows that ocular strain will be brought about. The

eyes, like other parts of the body, cannot be subjected to undue strain without suffering from the practice.

### Proper Illumination Essential

The subject of illumination in the motion picture theatre is an important one. The question of whether a picture can be viewed without eyestrain hinges vitally upon whether or not the playhouse is properly lighted while the picture is being shown. The general tendency is to make a house as dark as possible in the belief that if this is done and the picture is brought on the screen more brightly, eyestrain will be diminished. The truth of the matter is that the eyes react unfavorably to such sharp contrast as exists between a rather bright screen and dark surroundings.

On the other hand, too low illumination is not good for the eyes either. It is a perplexing problem to adjust the illumination in a theatre to where the picture can be shown to best advantage and the eyes of the audience still kept properly relieved. Efforts along this line can be considered successful only when the projectionist has managed to keep his show clear enough to provide easy vision without requiring too much darkness from the house to help him.

Last, but certainly not least, the projectionist must be careful to maintain his equipment in perfect condition if he is to cooperate in the attempt to reduce eyestrain in the motion picture theatres. Poorly kept machines project "jumpy" pictures, and "jumpy" pictures tend to produce eyestrain.

### Service Charge 'Equalization'

#### Saves Theatres \$750,000

More than \$750,000 will be saved to motion picture exhibitors in this country and in Canada as a result of "an equalization" in service charges on sound motion picture reproducing equipment, according to a statement by C. W. Bunn, general sales manager for Electric Research Products. It is understood that the new plan affects those theatres which are now paying more than \$20 weekly for equipment service, of which there are estimated to be more than 1,050. Negotiations for the adjustment were carried on between ERPI and the M.P.T.O.A.

### P. A. McGuire Convalescing

P. A. McGuire of the International Projector Corp., executive vice-president of the Projection Advisory Council and one of the outstanding figures in the projection field, is convalescing from a serious operation at St. Vincent's Hospital, 7th Avenue at 11th Street, New York City. Mr. McGuire entered the hospital on April 22nd and is not expected to be discharged until May 10th.



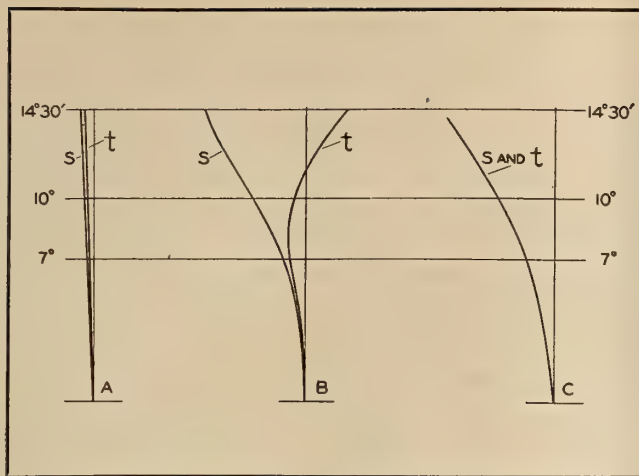


Figure 1

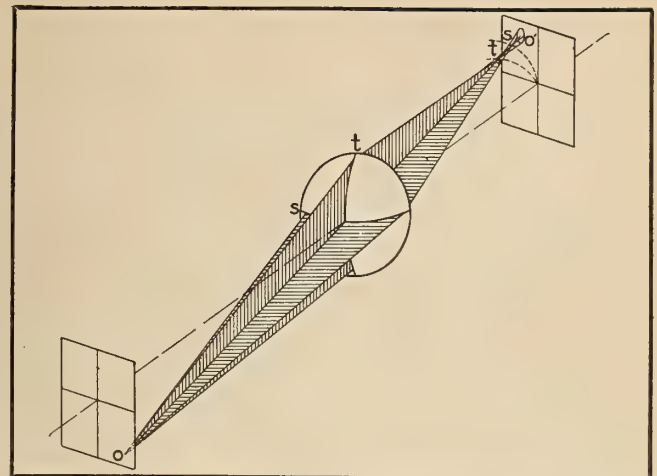


Figure 2

## Characteristics of the Super-Cinephor Lens

*From the Scientific Bureau, Bausch & Lomb Optical Co.*

**A**N anastigmat is a lens which has been fully corrected for astigmatism as well as spherical aberration and color aberration. It is an unfortunate provision of nature that a single lens, applied to the task of forming an image, gives us an image about as far from the quality we want as could well be and still have it recognizable as an image. The ideal image is the true projection of the object spaces onto a plane, such a projection as might be constructed by drawing single lines from every point in the object space through a pinhole and continuing them until they intersect the desired plane of projection.

The image formed by a lens differs from this ideal in many respects. In the case of the pinhole, the image is equally sharp no matter at what distance from it lies the plane of projection, for it is assumed to be so small that only a single ray of light from any one object point can pass through it. The lens, however, is of finite size and many rays from any one object point are received by the lens.

For perfect performance all these rays coming from any one object point should be reunited by the lens in another point on the desired plane of projection (the focal plane of the lens). It happens otherwise, however, as illustrated in Fig. 2.

Here there is represented an object point O lying in the margin of the field. Instead of the lens forming a point image of O, it forms as the nearest approach to it an elliptical spot of light at O'. If we explore the cone of light in the neighborhood of O', we will find that it nowhere comes to a point focus. At the place marked t in the diagram the light seems to be

concentrated in a short line as indicated and, at another place, such as s, it again seems to be concentrated into another line at right angles to the line at t. t is the focus for the meridian of the lens marked t, and s is the focus for the corresponding meridian of the lens.

### Astigmatism in a Lens

The phenomenon of the representation by the lens of object point O as a pair of perpendicular lines is called astigmatism. The distance from O' to the center of the distance between t and s is the curvature of field for the lens for this angle. The astigmatic difference (distance between t and s), and the curvature of field will vary from point to point over the field depending on the angle of the field of view. The focus of all points t and s is a pair of curved surfaces which constitutes the image of the object plane. These surfaces are indicated by the dotted curves connecting t and s in the figure with the center of the image.

By using more than a single lens, compounding, diverging and converging elements, and choosing glass and curvatures of surfaces to the best advantage, it is possible to overcome or "correct" astigmatism and curvature of field. Different lens constructions lead to different degrees of correction.

At C in Fig. 1, we have the curve

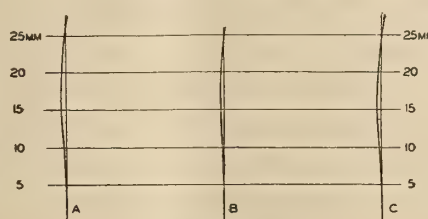


Figure 3

plotted for a lens of that general type characterized by a short back focus; surfaces s and t (Fig. 2) have been brought together, but they form a focal surface that is badly curved. These curves were obtained using a lens of this type procurable on the open market. B, Fig. 1, shows the curve of the Cinephor in which the focal surfaces practically coincide and are fairly flat up to an angle of 7 degrees and then diverge. At A, the curve of the Super Cinephor becomes almost perfect; this lens forms a focal surface almost a plane up to 14 degrees, 30 minutes.

To add to the significance of the curves, it is well to take into consideration the fact that for standard film the angular field of view of a 5-inch focus lens is about 14 degrees, and for a 4-inch lens about 18 degrees. For wide film the corresponding values are 23 degrees and 29 degrees. Since the curves in Fig. 1 are plotted for distance from the center of the field (half the total field), the above figures should be divided by two for reference to the curves.

### Spherical Aberration

Anastigmats have not hitherto found favor for projection because, for large relative apertures, the correction for astigmatism and curvature of field has been obtained at the sacrifice of definition in the center of the field. The construction used in the Super Cinephor, however, permits central definition equal to that afforded by the prevailing types of lenses in addition to the excellent flatness of field. This is shown in Fig. 3, which contains curves representing the spherical aberration for the three types of lenses described above.

The importance of spherical aber-



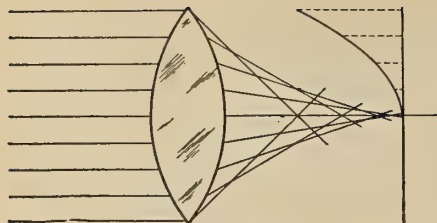


Figure 4

ration should be emphasized. It is illustrated in Fig. 4, which shows parallel light entering a simple lens and being focused at different places along the axis instead of at a point. Spherical aberration occurs in all uncorrected lenses, preventing them from forming sharp images. The outlines of the details in the field will be blurred, and black areas will be more or less gray instead of black. Good lenses are carefully corrected for spherical aberration.

Figure 3 shows at a glance that there is practically no difference between these three kinds of lenses when considering spherical aberration, and that the superior performance of the Super Cinephor in respect to its correction for astigmatism and flatness of field has been attained without sacrificing definition in the center of the field. In other words, no essential quality has been sacrificed in gaining the type of correction found in the Super Cinephor.

#### Correct Focal Lengths

The size of the picture on the screen is determined by the projection distance and the equivalent focal length of the objective. The formula is:

$$(a) \quad d = \frac{s(l-f)}{f}$$

or

$$(b) \quad f = \frac{s \times l}{s + d}$$

$s$  = width of aperture.

$d$  = width of screen image.

$l$  = projection distance.

$f$  = equivalent focal length.

There is given herewith an example of the use of this formula. The size of picture projected by an 8" lens at a 100-foot throw from a standard aperture is:

$$d = \frac{0.906 (1200-8)}{8} = 135" = 11' 3"$$

To find the focal length necessary for a given picture size, use the form (b).

$$f = \frac{0.906 \times 1200}{0.906 + 135} = 8"$$

The focal lengths given in the accompanying table represent those for which there have been developed specific grinding tools and test glasses. Other focal lengths can be made on special order, but at a considerably increased price; hence it is recommended that the screen margin be adapted to suit a standard focal length, thus

### Deny Injunction Against the Use of Pickets

A decision favorable to the Local Union was rendered recently by Judge Alfred Mack in Cincinnati in the first decision of its kind in that city in connection with a Union displaying banners in front of a theatre announcing that a Union projectionist was not employed. The case was that of Wilbur Finke, leasee of the Evanston Theatre, a suburban house, against the M.P.M.O.U. Local 165.

"Finke, a licensed but a non-union

assuring prompt delivery and highest quality. By selecting a standard focal length next longer than that called for in calculation under the formula, only a slight reduction in the size of picture or an increase in the width of the screen is necessary.

The picture sizes shown in the accompanying table apply to standard apertures (0.906"  $\times$  0.6795"), the only standard that has been adopted and

projectionist, acted as full-time worker, being relieved at meal times by another non-union projectionist. Local Union 165 posted pickets bearing banners in front of the theatre, and Finke brought suit for an injunction restraining this action. In his decision, Judge Mack said in part:

"In the opinion of The Court it cannot be said that the plaintiff solely operates the machine in question, and for that reason the case is distinguishable from a variant Minnesota decision upon the question."

generally used. The apertures used with sound-in-film systems have not yet been standardized, but the dimensions of 0.800"  $\times$  0.600" recommended by the S.M.P.E. are very close to the size used for sound film in all modern reproducing equipment.

To apply the table to this reduced size it is necessary to subtract 11% from the dimensions of the screen picture as given in the table.

### Showing Size of Screen Images at Different Distances With Lenses of Different Focal Length

SIZE OF PICTURE APERTURE 0.906"  $\times$  0.6795"

E. F in	40 ft.	50 ft.	60 ft.	70 ft.	80 ft.	90 ft.	100 ft.	110 ft.	120 ft.	130 ft.	140 ft.	150 ft.	160 ft.	170 ft.	180 ft.	190 ft.
2.00"	18.0 13.5	22.6 16.9	27.1 20.3	31.6 23.7	36.2 27.1	40.7 30.5	45.2 33.9									
2.25"	16.0 12.0	20.1 15.0	24.1 18.1	28.1 21.1	32.1 24.1	36.2 27.1	40.2 30.1	44.2 33.2								
2.50"	14.4 10.8	18.0 13.5	21.7 16.3	25.3 19.0	28.9 21.7	32.5 24.4	36.2 27.1	39.8 29.9	43.4 32.6							
2.75"	13.1 9.8	16.4 12.3	19.7 14.8	23.0 17.2	26.3 19.7	29.6 22.2	32.9 24.7	36.2 27.1	39.5 30.6	42.8 33.1	46.1 35.5					
3.00"	12.0 9.0	15.0 11.3	18.0 13.5	21.0 15.8	24.1 18.1	27.1 20.3	30.1 22.6	33.2 24.9	36.2 27.1	39.2 29.4	42.2 31.7	45.2 33.9				
3.25"	11.1 8.3	13.9 10.4	16.7 12.5	19.4 14.6	22.2 16.7	25.0 18.8	27.8 20.9	30.6 22.9	33.4 25.0	36.2 27.2	39.0 29.2	41.7 31.3	44.5 33.4			
3.50"	10.3 7.7	12.9 9.7	15.5 11.6	18.0 13.5	20.6 15.5	23.2 17.4	25.8 19.4	28.4 21.3	31.0 23.2	33.5 25.1	36.0 27.0	38.7 29.0	41.3 31.0	43.9 33.0	46.5 34.9	
3.75"		12.0 9.0	14.4 10.8	16.8 12.6	19.3 14.4	21.7 16.2	24.1 18.1	26.5 19.9	28.9 21.7	31.4 23.5	33.8 25.3	36.2 27.1	38.6 28.9	41.0 30.8	43.4 32.6	45.8 34.4
4.00"		11.3 8.5	13.5 10.1	15.8 11.8	18.0 13.5	20.3 15.2	22.6 16.9	24.8 18.6	27.1 20.3	29.4 22.0	31.6 23.7	33.9 25.4	36.2 27.1	38.4 28.8	40.7 30.5	43.0 32.2
4.25"		10.7 8.0	12.8 9.6	14.9 11.2	17.0 12.8	19.2 14.4	21.2 15.9	23.4 17.5	25.5 19.1	27.6 20.7	29.8 22.3	31.9 23.9	34.0 25.5	36.2 27.1	38.3 28.7	40.4 30.3
4.50"		10.1 7.6	12.1 9.1	14.1 10.6	16.1 12.1	18.1 13.6	20.1 15.0	22.1 16.6	24.1 18.1	26.1 21.1	28.1 22.6	30.1 24.1	32.1 25.6	34.1 27.1	36.2 28.6	38.2 28.6
4.75"			11.4 8.6	13.3 10.0	15.3 11.5	17.2 12.9	19.0 14.3	20.9 15.7	22.8 17.1	24.7 18.5	26.6 20.0	28.5 21.4	30.4 22.8	32.3 24.3	34.3 25.7	36.2 27.1
5.00"			10.9 8.2	12.7 9.5	14.5 10.9	16.3 12.2	18.0 13.5	19.9 14.9	21.7 16.2	23.5 17.6	25.3 19.0	27.1 20.3	28.9 21.7	30.7 23.0	32.5 24.4	34.4 25.8
5.25"			10.3 7.7	12.0 9.0	13.7 10.3	15.5 11.6	17.2 12.9	18.9 14.2	20.6 15.5	22.4 16.8	24.1 18.1	25.8 21.1	27.5 22.6	29.3 24.1	31.0 25.6	32.7 24.5
5.50"				11.5 8.6	13.1 9.8	14.7 11.1	16.4 12.3	18.0 13.5	19.7 14.8	21.3 16.0	23.0 17.2	24.6 18.5	26.3 19.7	27.9 20.9	29.6 22.2	31.2 23.4
5.75"				11.0 8.2	12.5 9.4	14.1 10.6	15.7 11.8	17.3 12.9	18.8 14.1	20.4 15.3	22.0 16.5	23.6 17.7	25.1 18.8	26.7 20.0	28.3 21.2	29.9 22.4
6.00"				10.5 7.9	12.0 9.0	13.5 10.1	15.0 11.3	16.5 12.4	18.0 13.5	19.6 14.7	21.1 15.8	22.6 16.9	24.1 18.1	25.6 19.2	27.1 20.3	28.6 21.5
6.25"				10.1 7.6	11.5 8.6	13.0 9.7	14.4 10.8	15.8 11.9	17.3 13.0	18.7 14.1	20.2 15.2	21.6 16.3	23.1 17.3	24.5 18.4	26.0 19.5	27.4 20.6
6.50"					11.1 8.3	12.5 9.4	13.9 10.4	15.3 11.4	16.6 12.5	18.0 13.5	19.4 14.6	20.8 15.6	22.2 16.7	23.6 17.7	25.0 18.8	26.4 19.8
6.75"					10.7 8.0	12.0 9.0	13.3 10.0	14.7 11.0	16.0 12.0	17.4 13.0	18.7 14.0	20.1 15.0	21.4 16.0	22.7 17.1	24.1 18.1	25.4 19.1
7.00"					10.3 7.7	11.6 8.7	12.9 9.7	14.2 10.6	15.5 11.6	16.8 12.6	18.0 13.5	19.3 14.5	20.6 15.5	21.9 16.4	23.2 17.4	24.5 18.4
7.50"						10.8 8.1	12.0 9.0	13.2 9.9	14.4 10.8	15.6 11.7	16.8 12.6	18.0 13.5	19.3 14.4	20.5 15.3	21.7 16.3	22.9 17.2
8.00"						10.1 7.6	11.3 8.4	12.4 9.3	13.5 10.1	14.6 11.0	15.8 11.8	16.9 12.7	18.0 13.5	19.2 14.4	20.3 15.2	21.4 16.1
8.50"							10.6 7.9	11.6 8.7	12.7 9.5	13.8 10.3	14.8 11.1	15.9 11.9	17.0 12.7	18.0 13.5	19.1 14.3	20.2 15.1
9.00"								10.0 7.5	11.0 8.2	12.0 9.0	13.0 9.8	14.0 10.5	15.0 11.3	16.0 12.0	17.0 12.8	18.0 13.5



# The Suppression of Background Noise in Sound Film Recording

By G. F. HUTCHINS†

**R**EPRODUCTION of sound from wax records has always been attended by extraneous noise in the form of high frequency scratching due to the failure of the material to present a perfectly smooth surface. The development and use of recording wax of higher refinement has been a part of the progress made in wax recording, but this inherent limitation has not been eliminated or radically reduced. The excessive pressure exerted through the small area of the needle appears to be a bar to further improvement. In fact, with the extension of the audio frequency spectrum into higher regions, as practiced in sound picture recording, the problem is aggravated by the impossibility of using cut-off filters to eliminate the unwanted noise. This is but one of the reasons for the greater popularity of film recording in meeting the demands of the picture industry.

Until recently, however, film recording was also subject to criticism on this score, for the combination of non-homogeneity and opaque material in the clear portion of the sound track together with photocell hiss at moderate light intensities resulted in background noise quite comparable to that experienced with disc records.

The problem of suppressing background noise in the film record has been a problem of making opaque that portion of the sound track not actually needed to carry the modulations. In variable area recording the answer has been to mask off as much of the clear portion of the track as is possible without cutting off any noticeable part of the recorded wave-form. With variable density recording the exposure must be biased to a low value such as to just allow sufficient range to the lower straight line portion of the H & D curve to permit the density variations necessary to the volume level at any instant. With the print thus darkened at the lower sound levels, very little light enters the photocell in the reproducer, and scratches, dirt, and other accumulations in the sound track present very low contrast in transmission to the remainder of the dark portion. In this way photocell hiss is practically eliminated, for the hiss level is nearly proportional to the amount of light entering the cell and noises due to dark deposits such as dirt are no longer prevalent because of the fact that they

are now part of a dark background instead of one of lighter density.

## Noiseless Recording History

It appears that the first practical applications of this method were realized some time ago by Mr. C. R. Hanna of the Westinghouse Company, and Mr. C. W. Hewlett of the General Electric Company. These investigators, among other experiments, made use of a portion of the signal used for operating a variable area oscillograph recorder to actuate a mechanism for automatically providing a minimum of exposure on the sound track. To do this, the "tapped" energy was amplified, rectified, and applied as a bias to the recording galvanometer signal current in just sufficient quantity as to hold the center line of the modulations as near to one edge of the track as possible and still permit of sufficient latitude for recording the motions of the vibrating light beam. The biasing current, being a "volume-controlled" quantity, could be made to vary exactly with the envelope of the signal wave-shape, and thus provided at all times just sufficient transparent track to accommodate the recording.

In applying the idea to sound picture releases, it was deemed advisable to alter the method in certain respects. With the low level modulations at the extreme edge of the track, it would have been necessary to provide a perfect adjustment of the scanning beam in every reproducer which was to handle the track thus recorded. Otherwise the lower level sounds would have been in danger of complete elimination, or at least poor reproduction if film weave occurred.

In order to avoid affecting projection methods or operations in any way, the sound track was recorded in the normal manner except for the addition of a shutter device operated by the "biasing current" for masking off the unused portion of the clear half of the track. This shutter mechanism is the invention of Hugh McDowell, Jr., of R. K. O. Studios. The center line of the modulations is then held at all times in the middle of the sound track, and the masking is done from the edge of the track toward the center instead of in the opposite direction as with the biased signal arrangement. This arrangement is manufactured commercially by R. C. A. Photophone, Inc.

Using this latter method with variable area recording, the first "noiseless recorded" production was com-

menced at Radio Pictures Studio in March, 1930. This production, "Dixiana," was released in August of 1930. Construction and operation of the preliminary apparatus used in making this picture was in the hands of Mr. McDowell of the R. K. O. recording staff, under the direction of Carl Dreher, director of sound for the same organization. Following the success of the method, all pictures recorded by Mr. McDowell have been made with the ground noise eliminating device as part of the equipment.

The Western Electric Company has also adopted anti-ground noise recording and several of their licensees have recently made a number of pictures in their studios with a device substantially similar in electrical features to that used by Hanna and Hewlett. The biasing current, however, is applied to the light valve used in the variable density type of recording. Here the ribbons of the valve are brought very closely together at low modulation levels by means of the biasing current, and increases in modulation level cause the biasing current to vary so as to open up the ribbons and allow sufficient amplitude of vibration to accommodate the signal level.

## Physical Setup for Recording

With the variable area system of recording, the normal recording apparatus is used, together with an additional amplifier and rectifier for providing the shutter current, and a small shutter attachment which becomes a part of the recording optical system. The apparatus scheme is roughly shown in Fig. 1. With light valve recording a similar additional amplifier and rectifier are provided, with proper biasing adjustments for controlling the spacing of the valve ribbons. In either case the entire additional equipment is mounted on a small panel which may be made a part of the regular amplifier equipment.

## Processing of the Film

In the case of variable area recording there is quite obviously no problem introduced pertaining to film processing. The modulated portion of the sound track is recorded exactly as it has always been recorded, and the film may be developed and prints made in exactly the same manner used for ordinary variable area track. As a matter of fact the film may be handled with less care without serious damage, for finger marks and dirt

†Engineering Dept., RCA Photophone, Inc., Hollywood.



on the film are of relatively less importance.

With variable density records the laboratory problem is somewhat complicated, for extreme care must be observed in adhering to the straight line portion of the exposure density curve. Otherwise the lower modulations may operate on a more horizontal portion of the curve with an attendant "volume distortion" which has the effect of making the low level sounds lower in proportion than they actually are. A study of the H & D curve will make this clear. While some difficulty has apparently been experienced with this problem, most of the variable density pictures have been well handled, and with proper care in the laboratory satisfactory results may be had.

#### "Noiseless" Film in the Theatre

As far as the projectionist is concerned, his work is unaffected by the innovation of "noiseless recording." A well designed and operated reproducing installation need be altered in no way whatever for the reproduction of such recording. In many installations, however, where careless design and maintenance has been incorporated, the amplifier noise and generator hum in the installation itself may have been just below the level of normal film background noise. When noiseless recordings are run on such equipment, the object of the recording innovation may be entirely defeated due to the sudden appearance of this system noise which was not apparent with the old system of recording. It is necessary in such cases to go over the reproducing equipment in an effort to correct the sources of noise in the equipment itself.

In some cases it has been found advisable to replace low sensitivity photocells with cells of higher sensitivity in order to make necessary less amplification thereafter; this in an effort to reduce system noise. In the better theatres very little change has been necessary. In the case of R. C. A. Photophone equipment, at least, no alterations whatever have been required for the correct rendition of noiseless recorded productions. It is well, however, that the people concerned with reproduction have an understanding of some of the artistic features involved.

#### Relative Levels and Extension of Range

In the R. C. A. Photophone system of background noise suppression, a D. C. amplifier is used to actuate the masking shutter. At low or negligible signal levels, a sufficient plate current is established to hold the shutter in a position such as to mask off all of the track with the exception of a narrow strip down the center having a width of about five to ten thousandths of an inch. This margin

is used purely as a safety factor in the adjustment. As the signal level increases, the grid bias on the D. C. stage is shifted so as to decrease the plate or shutter current and allow the shutter to move away from the center of the track so as to permit the modulations to record themselves. As an additional safety factor, the amplifier stage just mentioned operates on a slightly curved characteristic such that the response of the shutter is greatest at the start, or at low levels. This permits the safety margin to be adjusted to a minimum.

Obviously, the amount of suppression of the clear track noise depends largely upon the adjustment of this safety margin. If the margin is set at, let us say, seven thousandths, the width of the clear portion with no sound modulating the track is just one-fifth that of a track recorded by the old system. This means a reduction in background noise of five-to-one or approximately 14 decibels. It is immediately evident that the device may be used in recording either as an instrument for the suppression of background noise, or for the purpose of extending the volume range of the recorded sounds.

For instance, if a given sound is recorded from the stage at a level 14 decibels below that which should have been used with the old system, the ratio of signal to noise will be the same as with the old system and the higher level. This conservation of track at the same time allows an increase in volume 14 decibels greater than with the old system, so that an extension in range of 14 decibels has been accomplished with the same level of background noise in the theatre. It should be pointed out, however,

that the additional 14 decibels amplification must be provided in the theatre, so that the effect may be somewhat minimized by poor reproducing equipment.

If the recording levels are maintained the same in the studio as though the old sound track were being used, and if the amplification in the theatre is also held the same, then the resulting levels of sound in the theatre will be the same, but the background noise will be reduced by an amount varying from zero to 14 decibels. The actual amount of reduction depends upon the sound level at the instant in question. At the low levels, where background noise becomes noticeable, the full effect is obtained. There is involved here a consideration which is of interest, for in this case there is actually an increase in the recording range. In most theatres the sound level is held sufficiently high to carry the weaker sounds over the house noise.

Now, with the disturbing background noise reduced 14 decibels the lower level sounds begin to carry much greater intelligibility. In fact these sounds appear to be noticeably increased in volume. The effect is in the nature of an aural illusion. One may easily appreciate the situation if he imagines the sound made by a mouse creeping about the floor of first a fairly noisy room, and secondly a room which is absolutely quiet. In the first case the creature may make his presence known, but the sound will not seem very great in volume, in fact one might well sleep under these conditions. In the second case, however, where one's consciousness is at-

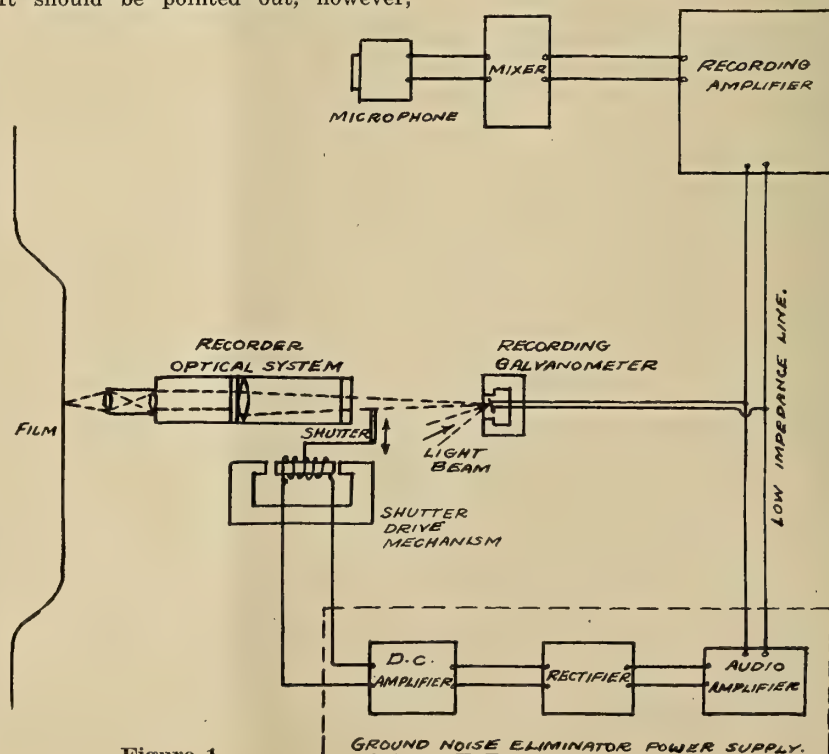


Figure 1



tuned to the condition of absolute quiet, the sound of the creature will seem quite loud, and most certainly disturbing to any attempt at repose. In this connection, the effect upon sound illusion is of interest.

The human being, while somewhat romantic and inclined toward allowing his fancies to wander, has nevertheless lived so long in an environment demanding his concentration upon tangible things that he is unconsciously reluctant to loose his grasp upon anything which aids him in fixing his position. This fact is the principal stumbling block of motion picture technique. One of the reasons for using a wider picture is that the visual boundaries are removed to a region where it is more difficult for the spectator to mentally grasp them, and he finds it simpler as a result to accept the boundaries beyond the camera lens; in other words he lives less in the theatre and more in the scene.

The same thing is true with the illusion of sound. When the listener has some basis on which to measure the sounds which he hears, he is inclined toward a fast hold upon the thing which links him to his true surroundings. Remove this element of his physical world, and he is induced to lapse further into the world beyond the screen or speaker. The removal or suppression of any such element, as background noise in this case, eliminates at least partially one con-

tact with the physical environment of the theatre. In this way the dramatic illusion is fostered.

#### Introduction of Distortion

In performing the operations described, where noise suppression is accomplished on the original recording, no anticipation of sudden rises in volume is possible with the shutter or valve bias. This necessitates cutting off the first few cycles of any suddenly increasing modulation, for the shutter or valve bias must operate with sufficient inertia to prevent its producing a modulation which might in itself form a reproducible wave. It has been found, however, that no noticeable distortion is introduced because of this failure.

Sounds of any considerable duration establish their character without the aid of the first few cycles, and stacatto sounds have not sufficiently sustained character to affect them noticeably. When careful laboratory treatment is provided in the case of variable density track, and where normal precautions have been adhered to in adjusting the recording mechanisms of both variable area and variable density recordings, no quality impairment in the theatre should be encountered because of the noiseless feature. The advantages on the contrary are manifest, and there appears to be no doubt that the recording of the future will include some such noise eliminating means as those described.

#### —Hartford City, Ind.—

*Editor, M. P. Projectionist:*—I am writing in behalf of the projectionists of this city. We have examined all of the latest prints thoroughly as they have entered our projection rooms and have found many variations. The standard prints are as good as we ever expect to see on the screen, and they compare favorably with our opinion as to how this problem should be approached. However, we have received so many prints that are sub-standard that there is little incentive for us to observe the standard generally. One print is okay; then the next print is all butchered up until there is hardly anything left to it except two start marks and two C. O. marks, and no tails to either end of the print.

We have received prints in this form: no tails, no C. O. cues, patches not examined by the exchange—and everything one terrible mess. We have also found prints that when placed on the start mark and then run down to the picture, show at half or quarter-frame—a result of poor splicing and the inability of projectionists to tell exactly where the frame lines are on the black leader. It seems to us that all leaders should be marked the full width of the picture with either a black or white line at the intersection of each frame. All exchanges are guilty of poor inspection work, but the Fox Film Corp. is the worst offender in this respect in this vicinity. This exchange also puts out perfectly black leaders and tails.

In the past we have received 8, 10, and 12 reels of features that could easily have been put up on half that number of reels. Isn't there some way of making up full reels instead of half-size reels? We are 100% in favor of 2,000-foot reels. This change would eliminate at least three-fourths of film mutilation, providing the larger reels were full and did not run short by as much as 400 feet. If this matter of reel sizes were put to a vote, the 2,000-foot size would win overwhelmingly.

We would like to have your support in starting the fight for injecting a little common sense into this matter of good theatre reproduction of film and sound.—R. H. REED.

#### —Montpelier, Ohio—

*Editor, Motion Picture Projectionist:*—Herewith a copy of the letter which was sent in answer to the Academy questionnaire, which may prove of interest to you.

Theatre: Kaufman, Montpelier, Ohio. First-run house, seating 500, with three changes weekly. Equipment: De Forest Phonofilm, using 100% sound-on-film program. Suggestions on alternations of cues of Standard Release Prints: Reduce size of dots to .061 inches with serrated edges and reduce to three in number for each cue, and leave in same position or move slightly higher (toward top of frame as far as proportional apertures will allow). Do not place down in right-hand corner

## Standard Print Survey Now in Progress

QUESTIONNAIRE forms on the Standard Release Print are now being circulated among projectionists in this country and Canada by the Academy of Motion Picture Arts and Sciences in conjunction with the Projection Advisory Council and the American Projection Society. All parts of the country will be covered by the survey, the results of which will provide an accurate index as to prevailing sentiment on the plan among projectionists.

The questionnaire, a copy of which was printed in the April issue of MOTION PICTURE PROJECTIONIST, consists of a series of questions covering the following: name of theatre, circuit or independent theatre, seating capacity, type sound reproducing equipment, percentage of sound-on-film and sound-on-disc, number of projectionists per shift, size of cues number of frames marked, condition of prints when received, position of S. R. P. dots, and the general condition of leaders and cues on prints received at the theatre. In addition, the form provides space for suggestions by the projectionist for im-

provement of the S. R. P. and other technical matters.

#### Results Ready May 20th

It is hoped to complete the survey within three weeks, after which the results will be tabulated and plans laid for effecting improvements in accordance with the majority opinion.

Once set, the final standard agreed upon will be introduced and general observance of the requirements affecting its operation will be sought through the medium of the district representatives of the Projection Advisory Council, of which there are 37 in various key cities, and in this work the Film Boards of Trade, working under the supervision of the Academy and the M. P. P. D. A., will cooperate. The Projection Advisory Council representatives will be under the supervision of and will report to James J. Finn who will act for the Council.

A complete list of these 37 representatives will be announced on May 20th, at which time complete tabulation of the survey results is expected to be available. Two representative letters on the S. R. P. plan follow:



as, on mob and any moving scenes where the lower half of the picture is moving, you cannot distinguish dots or any form of opaque cues without straining the eyes and probably missing the cues entirely.

Condition of Movietone prints received here: The start motor cues are always O. K. The change-over cues are always there but often several of the 12 remaining frames are missing. A suggestion for overcoming this fault: All projectionists doubling should cut reels six or eight frames ahead of change-over cue as this not only leaves the unaltered foot between the change-over and the blank leader but dialogue on the doubled reels will be absolutely continuous and this automatically eliminates one cue while running double reels. Also: significant dialogue and sound-on-

film prints should end at least 30 frames (1¼ feet) from end of reels and likewise start at least 1 foot from first frame of picture on incoming reel. (At present Fox Prints need this change). Also: with the decreasing number of disc equipments, I firmly believe all exchanges should handle all prints on 2,000-foot reels.

May I add a word of praise for the committee for standardizing—the threading leader and markings are really fine. And the change-over system—although many projectionists and managers object to the use of visible cues, they readily admit standardizing of prints has in turn improved the projection results on their screen—and until someone devises a much better system, let us have the S. R. P.—E. F. STAHL.

## Projection Room Data in N. Y. Code

SO RAPID has been the development of the modern theatre as a whole, and of the modern projection room within the theatre, that not a single existing building code covering these matters is considered by competent judges to adequately serve the purpose for which it was intended. During the past ten years much progress has been made in the matter of drafting new laws concerning the construction and operating safeguards within the theatre, but nearly all of these improvements have been in the nature of additions to existing codes—codes which in some cases were drafted as far back as 35 years ago. Such procedure inevitably failed to solve the problem, and considerable expense, confusion, and dissatisfaction has been the result.

Recognizing the imperative need of prompt action, a representative committee has been at work in New York City for the past several months on a *general revision* (not an addition but a revision), of the outdated Building Code. The work of this committee is now completed and its findings presented to the proper officials. While the recommendations included in this committee report have not yet been officially accepted, reliable advices indicate that they will be shortly. Subsequent to the official acceptance of this report, it is expected that the code will form the basis for similar work in other cities throughout this country and Canada.

Included in this committee report is a section devoted to projection rooms, film storage, safety curtains, workshops, and stages, which should prove of interest to every projectionist. Those sections of the report of interest to projectionists have been abstracted and are appended hereto:

### Stage Requirements

All that portion of the stage extending from each side of the pro-

scenium opening to the enclosure walls and from the inside of the proscenium wall to the front edge of the stage shall be of fire resistive construction.

The stage shall be separated from the auditorium by a fire-wall of solid masonry, extending at least 4 feet above the stage room or the auditorium roof if the latter be the higher.

This wall shall be without openings above the stage level except the proscenium opening and one door opening on each side of the stage at the stage level. At most one door opening may be provided in this wall at each side of the orchestra pit, below the stage level. All door openings shall have a maximum width of 3 feet.

Door openings from stage to auditorium and from under stage to pipe passages and plenum chambers shall be protected on each side of the wall with a self-closing fireproof door, arranged to open from either side of the wall. Door openings from the stage to the pit shall be protected with single self-closing fireproof doors arranged to open from either side of the wall.

The space underneath the stage shall be subdivided by solid masonry walls at the sides of the proscenium opening, extending from the proscenium wall to the rear wall of the structure, and from the ground to the under side of the stage door.

Openings in these walls shall be equipped with fireproof self-closing doors.

### Workshops

Workshops and storage or property rooms shall be located only at the stage level and on the stage side of the proscenium wall. They shall be separated from the stage by solid masonry or reinforced concrete walls at least 12 inches thick. All openings to the stage shall have automatic or self-closing fireproof doors on both sides of the wall. All furniture and fixtures or property rooms shall be

incombustible material. Paint bridges are forbidden.

### Protective Curtain

The proscenium opening shall be provided with a curtain of incombustible material approved by the Superintendent, having a lap of 2 feet at the top and 18 inches at each side, sliding at each side in iron grooves, which shall have a minimum depth of 12 inches. The curtain shall be securely fastened to the proscenium wall and at its lowest position shall rest on masonry at least 12 inches thick extending from the foundation to the curtain, or upon a strip of linoleum cork or rubber composition directly affixed to such masonry. The footlights shall be placed at least 2 feet away from the proscenium curtain. The curtain shall be raised at the commencement of each performance and lowered at the close and be operated by approved machinery.

Satisfactory proof must be submitted and filed with the application that the curtain is capable of withstanding a temperature of 1,700 degrees F., for a period of at least 45 minutes.

All beams supporting curtain slots in the rigging loft shall be designed to sustain a minimum load of 400 pounds per linear foot in addition to a uniformly distributed load of 50 pounds per square foot on the rigging loft. Beams supporting headblocks shall be designed to sustain a load of at least 1,200 pounds per linear foot. The design of beams supporting the proscenium curtain or curtain sheaves shall provide for an impact allowance of 100 per cent.

### Projection Room Requirements

The use of any cinematograph or other apparatus for projecting moving pictures which uses easily flammable films more than 10 inches in length is forbidden in any structure, place of public assembly or entertainment unless such projecting apparatus is enclosed in a booth constructed of incombustible materials as required by *Construction of Booths or Portable Booths* and the certificate required by *Inspection and Certification for Permanent Booths, Inspection and Certification of Portable Booths and Miniature Cinematograph Machines*, shall have been issued to the owner or lessee of the premises where the booth is located.

The booths required shall be constructed according to plans and specifications approved by the Superintendent. Plans and specifications for such booths shall be approved by the Superintendent only when they provide substantially for the following requirements:

Such booths shall be at least 7 feet in height. If one machine is to be operated in such booth the floor space shall be at least 7½ by 10 feet. If



more than one machine is to be operated therein, 24 additional square feet shall be provided for each additional machine.

#### Room Specifications

Permanent booths shall be constructed of incombustible materials having a fire resistive rating of at least 3 hours.

If temporary booths are constructed of incombustible materials other than masonry or asbestos, they shall be constructed with angle framework of approved incombustible material. The angles shall be at least 1¼ by 3/16 inches and the adjacent members shall be joined firmly with metal angle plates. The maximum distance between angle members of the framework shall be 4 feet on the sides and 3 feet on the front, rear and top of the booth. The sheets of asbestos board or other approved incombustible material shall be at least ¼ inch thick and shall be securely fastened to the framework with metal bolts or rivets. The incombustible material shall completely cover the sides, top and all joints of the booth. The floor space occupied by the booth shall be covered with incombustible material at least ¾ of an inch thick.

All booths shall be so insulated as not to conduct electricity to any other part of the structure. Booths shall be provided with two means of egress consisting of passageways, stairs or ladders and located one at each end of the booth. One of these means of egress shall be through a door at least 24 inches wide and 70 inches high. All such doors shall be self-closing and shall open in the direction of egress.

#### Provision for Windows

One operating window shall be provided for each machine and one for each operator. Such windows shall be as small as will permit the necessary service, and shutters of approved incombustible material shall be provided for each window. The shutters shall be so arranged as in the event of fire to close the window openings automatically by the operation of approved fusible and manual releasing devices.

Where a booth is built against the exterior wall of a structure a window shall be permitted in such wall for the comfort of the operator. Booths shall contain an approved box of incombustible material for the storage of films not on the projecting machine. The storage of films in any other place on the premises is forbidden.

Films shall be rewound or repaired either in the booth or in some other enclosure made of incombustible materials, but the room in which motion picture machines are operated shall be separated from the rewinding and other accessory rooms by fireproof partitions provided with self-closing

fireproof doors. Booths in which projecting machines are operated shall be provided with separate opening or vent flue in the roof, or upper part of its side wall, leading to the outer air from the rewinding room and from the machine room. Such flues shall be at least 50 square inches in cross section and made of incombustible materials. When booths are in use a current of air at the minimum rate of 30 cubic feet per minute shall be maintained through the booth to the outer air, and sufficient to furnish a complete change of air every ten minutes.

#### Existing Rooms

Existing booths, legally installed and approved, shall be exempted from the other requirements of *Booths*, provided they are constructed of rigid incombustible material so insulated as not to conduct electricity to any other part of the structure, so separated from any adjacent combustible materials as to prevent the communication of fire through intense heat in case of combustion within a booth, and comply with the requirements of *Specification* in respect to dimensions, vent flues, boxes for storage of films and for windows and doors.

After the construction of a booth has been completed the Superintendent shall, within 3 days after receipt of written notice of that fact, cause such booth to be inspected. If the provisions of *Booths Required*, and *Specifications* have been complied with the Superintendent shall issue to the owner or lessee of the premises on which the booth is located a certificate stating that the provisions of those sections have been complied with.

#### Portable Booths

Where motion pictures are exhibited daily for one month or less, or at most 3 times a week in educational or religious institutions or bona fide social, scientific, political or athletic clubs a portable booth may be substituted for the booth required by *Booths Required* and *Specifications*. Such portable booths shall be at least 6 feet high and at least 20 square feet in area, and shall be constructed of asbestos board, sheet steel of at least No. 24 United States Gage, or of other approved incombustible material.

Such portable booths shall comply with the requirements of *Specifications* with reference to windows and doors, but are exempted from the requirements for vent flues. The floors of such booths shall be lifted at least ½ inch above the permanent support on which they are placed and sufficiently to allow the passage of air between the floor of such booths and the platform on which they rest, and they shall be so insulated as to pre-

vent the conduction of electricity to any other portion of the building.

#### Exemption

Miniature motion picture machines in which the maximum electric current used for the light is 350 watts are exempted from the requirements of *Booths Required*, *Specifications*, *Existing Booths*, *Inspection* and *Portable Booths*. Such miniature machines shall be operated in an approved box of incombustible material constructed with a fusible link or other approved releasing device to close instantaneously and completely in case of combustion within the box. The light in such miniature machines shall be completely enclosed in a metal lantern box covered with non-removable roof. Miniature motion picture apparatus, which uses only an enclosed incandescent electric lamp and approved acetate of cellulose or slow burning films and is of such construction that films ordinarily used on full sizes commercial picture apparatus cannot be used are likewise exempted from the requirements of the above named sections.

Before moving pictures are exhibited with a portable booth under the requirements of *Portable Booths*, and before miniature machines without booths are used as permitted under *Exemption*, a certificate of approval shall be obtained from the Superintendent.

Booths in theatres shall be subject to the same requirements as booths in motion picture theatres.

#### Planes Figure in ERPI Service

Twentieth century transportation is the medium by which the service staff of Electrical Research Products is meeting twentieth century emergency needs. During the past year the staff covered 5,000 miles by airplane responding to S. O. S. calls from 21 Western Electric equipped theatres according to H. M. Wilcox, ERPI's Vice President in charge of operations. The significance of the aerial figures lies in the fact that the more expensive mode of emergency travel meant an actual saving to exhibitor's box office because the speed with which the service was rendered enabled the show to go on on time.

Probably the most drastic use of airplane travel was in the case of an emergency call from Shea's Theatre, Fitchburg, Massachusetts. The distance was only 80 miles from a service office but the call came on a Sunday afternoon when the roads were congested with automobile travel. Instead of chancing delays in such crowded traffic, the service engineer chartered an airplane for the short journey and was able to have the equipment readjusted in time for the evening show.



# As *The* EDITOR Sees IT

## ¶ *Improved Color Films*

RECENT improvements effected in the equipment for the production of colored motion pictures have given a new impetus to this phase of the business. Heretofore the definition in color film has been very unsatisfactory, and dissatisfaction with the various processes has been widespread. So pronounced, in fact, were these defects that even the casual moviegoer voiced his objection to color subjects. Faced with the necessity for immediate improvement, the technical forces in the color film field buckled down to hard work and after considerable concentration and not a little perspiration succeeded in effecting improvements. The most important result of this intensive work is a much faster lens which gives every promise of improving the definition of color films by at least fifty per cent. This estimate may appear to be an exaggeration; but it should be remembered that at least this degree of improvement was necessary if color films were to maintain their position in the industry.

Production schedules for the coming year reflect the confidence of producers that this art is much advanced, and this confidence should serve to spur the color film technicians on to even greater effort for improvement.

## ¶ *Improvements in the S.R.P.*

PRESENT indications are that there will be some changes made in the general make-up of the Standard Release Print following the tabulation of the results of the survey now in progress throughout the United States and in Canada. These changes will probably be concerned with the number and size of the dots now used as a visual signal on the standard prints. It is expected that the dots will continue to appear in the upper right corner, as heretofore, according to the preferences of projectionists who have commented on the plan. It seems pretty generally agreed that the visual signal will remain, and this despite the fact that this feature of the plan occasioned criticism of the bitterest sort prior to and immediately following its introduction.

Projectionists everywhere have lent magnificent aid in the establishment of the Standard Release Print. In fact, the major problems of the plan now appear to be the overhauling of the studio and exchange facilities so that all prints may be produced by the studio and distributed by the exchanges in accordance with S.R.P. specifications. Our personal opinion, following an inspection tour of several Eastern states, is that the most pressing problem in connection with the plan lies in improving exchange procedure in the handling of the prints. Inspection of film in the exchanges is a farce; and unless this end of the work is subject to immediate overhauling and subsequent strict supervision, we may just as well

forget about the Standard Release Print. We do not mean to imply that projectionists are above criticism for the manner in which they handle prints, for there still are many projectionists not worthy of the name who continue to mutilate film. By and large, however, projectionists all over the country do not do one-tenth the damage done by film exchanges through inefficient inspection.

Prevailing conditions throughout the country amply substantiate our claim that exchanges are responsible for a majority of the present trouble, but our saying so will result merely in our being charged with favoritism of the projectionist. Yet we think we shall bear up well under the strain, particularly since it would require but the most cursory inspection to prove the truth of our assertion. As for projectionists, they need not think that their work is done; for once a definite routine for both studios and exchanges is established, the burden of maintaining the standard will fall upon the individual worker in the projection room.

Well, we shall see what we shall see when such changes as are decided upon are made in the S.R.P., and shortly after these changes go into effect we shall also see just where the fault lies in its operation.

## ¶ *Prospects for Progress in Television*

THE establishment in New York City of the first sight and sound studio to operate on a more or less regular schedule has given a new impetus to television work. The mere opening of this studio is not enough in itself to warrant the assertion that television has "arrived," yet the venture is indicative of definite progress in the art and shows the willingness of those who are sponsoring the project to back their opinions with a cash outlay, without which no amount of technical sweating is worth very much. Coincident with the opening of this New York studio came the announcement that the *Chicago Daily News* is making ready to transmit a nine-foot picture.

All this activity indicates a healthy growth of the television baby, but it does not mean that the art has progressed to that stage where it may be considered to possess definite commercial value. We can safely sit back and await the next broadside in the public press anent a "re-invention" of television, without which no season of the year may be deemed officially opened or closed. Television enthusiasts are experiencing much difficulty in attracting sufficient capital to the art, and this condition is retarding considerably the progress of the work. If only some half-baked promoter or a less than half-baked publicity man does not in the near future undo the work of several years by perpetrating a gigantic stock swindle, by the former, or by continuing to get printed in the daily press a screaming story of television "arrived," by the latter, we may expect encouraging progress in the art during the balance of the year.



# Comparison of Light, Sound and Electricity

By HUGO LATELTIN†

ALL energy manifestations—for instance, the light emission by an electric carbon arc, or the sound waves produced by a loud speaker—possess quality and quantity. Quality and quantity are the two terms which describe any sensory experience. These terms are not opposites, but rather explain a sensory experience from two different angles. The one is subjective and the other objective. This means, then, that any sensory stimulation by an outside energy source has a two-fold reaction in our consciousness: it reacts subjectively as an expression of quality and objectively as quantity.

Quantity, being objective, is readily

*Motion picture projection today is the beneficiary of so many branches of scientific endeavor that it is one of the most interesting of occupations. To coordinate the knowledge required in this field and to make this knowledge more accessible through comparison of the different branches will aid in making the work even more attractive to the practical projectionist.*

subjected to analyzation and study. It is with quantity that we are mainly concerned here; and the accompanying table contains fundamental formulas relating to the energy manifestations of light, sound, and electricity.

Corresponding to each quality of certain light, sound, and electric vi-

brations, we find a constant and unalterable wave-length and frequency for the particular vibration under observation. In the accompanying table the first horizontal column contains the formulas for wave-length, frequency, and velocity for light, sound, and electricity. In considering any one of these formulas we notice that they are unvariable. Considering, for example, a certain color, we can find only one definite wave-length and frequency corresponding to it. The velocity of all color-vibrations remains the same.

All frequencies manifest themselves within certain quantities of energy. Energy, treated as a unit of quantity, is usually the product of its intensity multiplied by the cross-section over which energy is active. The second and third columns in the accompanying table contain energy for-

Comparative Table of:—

	Light		Sound		Electricity	
Type of Vibration	Symbol	Formula	Symbol	Formula	Symbol	Formula
Wave-Length	$l$	$l = \frac{v}{n}$	$l$	$l = \frac{v}{n}$	$l$	$l = \frac{v}{n}$
Frequency	$n$	$n = \frac{v}{l}$	$n$	$n = \frac{v}{l}$	$n$	$n = \frac{v}{l}$
Velocity	$v$	$v = l \times n$	$v$	$v = l \times n$	$v$	$v = l \times n$
Volume of Vibration						
Area	$S$ (Surface in sq. m. or sq. ft.)	$S = \frac{F}{I}$	$S$ (Surface in sq. m. or sq. ft.)	$S = \frac{W}{P}$	$A$ (Current in amperes)	$A = \frac{W}{V}$
Intensity	$I$ (Brilliance in candles)	$I = \frac{F}{S}$	$P$ (Pressure in dynes)	$P = \frac{W}{S}$	$V$ (Pressure in volts)	$V = \frac{W}{A}$
Volume (Quantity)	$F$ (Flux in lumens)	$F = I \times S$	$W$ (Power in Watts)	$W = P \times S$	$W$ (Energy in watts)	$W = V \times A$
Volume of Vibration When Propagated						
Area	$S$ (Surface in sq. m. or sq. ft.)	$S = \frac{F}{E} = \frac{Fd^2}{I}$	$S$ (Surface in sq. m. or sq. ft.)	$S = \frac{W}{E} = \frac{Wd^2}{P}$	$A$ (Current in amperes)	$A = \frac{W}{V} = \frac{V}{R}$
Intensity	$E$ (Illumination in meter candles (lux), or foot candles)	$E = \frac{F}{S} = \frac{I}{d^2}$	$E$ (Pressure in dynes)	$E = \frac{W}{S} = \frac{P}{d^2}$	$V$ (Pressure in volts)	$V = \frac{W}{A} = RA$
Volume (Quantity)	$F$ (Flux in lumens)	$F = E \times S = \frac{SI}{d^2}$	$W$ (Power in watts)	$W = E \times S = \frac{SP}{d^2}$	$W$ (Energy in watts)	$W = V \times A = RA^2$ or $\frac{V^2}{R}$

## Standard Units for Light, Sound and Electricity

**Light:** The standard unit for *Brilliance* is the Candle. (Electric lamps standardized at a national standardizing institution, are commonly used.)

The standard units for *Illumination* (on a surface), is the meter-candle and the foot-candle. A light source of one candle will give an illumination of one meter-candle at a distance of one meter, or one foot-candle at a distance of one foot.

The standard unit for *Flux* is the Lumen. It represents the volume of light necessary to illuminate one square meter with an intensity of one meter-candle, or one square foot with an intensity of one-foot candle.

**Sound:** The standard unit for *Pressure* is the Dyne. The dyne is equal to a force necessary to accelerate one gram one centimeter per second.

The standard unit for *Power* is the Watt.

**Electricity:** The standard unit for *Current* is the Ampere.

The standard unit for *Electric Pressure* is the Volt.

The standard unit for *Electric Energy* is the Watt.

## Limiting Values for Light, Sound, and Electricity

**Light:** Perceptible wave-lengths—0.016—0.032 mil., or  $\frac{1}{1,000}$

0.4-0.8 microns (1 micron =  $\frac{1}{1,000}$  mm).

Frequency per second—400,000,000,000—800,000,000,000.

Velocity per second—186,324 miles, or 299,860 kilometers.

**Sound:** Perceptible wave-lengths—0.0366-68.75 ft., or 0.0111-22.2222 m.

Frequency per second 16—30,000.

Velocity per second (in air), 1,100 ft., or 335 m.

**Electricity:** Wave-lengths—132-4,800,000 mil., or 3,300,-120,000,000 microns.\*

Frequency per second—2,500,000-90,000,000,000.

Velocity per second—186,324 miles, or 299,860 kilometers.

\*Figures from Glazebrook's Dictionary.



mulas; energy in a static condition is considered in the second column; while the changes brought about when this energy is propagated are considered in the third column.

The compilation of formulas in this table is an attempt to provide a comparison of the fundamental laws applying to light, sound, and electricity. After studying the table, and also the explanatory notes on standard units, we are able to draw certain conclusions with regard to the similarity existing between these laws. Although this table is in many respects purely of theoretical value it can readily be applied to practical problems in the field of motion picture projection.

Referring to the table we notice that the first horizontal column contains laws relating to wave-length, frequency, and velocity. A quick glance will show that these laws are the same whether applied to light, sound, or electricity.

The second horizontal column, containing formulas on volume of vibration, reveals also a striking similarity for the different classifications of energy. The symbols used vary, but the laws remain essentially the same. Comparing, for example, the formulas  $F = I \times S$  (light), and  $W = V \times A$  (electricity), we find them fundamentally equal. In both cases we multiply the intensity by the cross-sectional area over which the intensity is acting.

In the third horizontal column, dealing with changes effected when energy is transmitted, the laws in light and in sound are the same. Light and sound (from a point source), propagate in all directions and diminish in their intensity in the same proportion as the square of the distance from the source increases. On the other hand, electricity, when conducted along a wire, does not obey the inverse square law, but follows Ohm's Law. For this reason we find the similarity in the third column dis-

I  
turbid:  $E = \frac{I}{d^2}$  in light is quite similar

P  
to  $E = \frac{P}{d^2}$  in sound, but does not

admit of favorable comparison with  $V = R \times A$  in electricity.

The formulas contained in the accompanying comparative table can readily be applied to motion picture projection. Following are a few examples:

1. Considering a standard size screen of 15 ft. width and 13.6 ft. height. The area of this screen in square feet will be 15 x 13.6, or 204 sq. ft. If the illumination per square foot, is for instance, 2.5 foot-candles, the total volume of light emitted by the screen equals, according to the formula,  $F = E \times S$ , or  $F$

$= 2.5 \times 204$ . The volume of light therefore is 510 lumens.

We can proceed further and estimate the probable size of arc necessary to illuminate a given screen. Citing the above screen of 204 sq. ft. which emits 510 lumens, and considering the efficiency of an ordinary carbon arc as about 15 lumens per ampere (*P. R. Bassett, S.M.P.E. Trans., No. 11*), we will require an arc of about 34 amperes to properly illuminate this screen.

2. In calculating the energy used in the emission of sound by a loud speaker, the problem is simplified when we consider that one watt of sound energy is equal to one watt of electric energy. Knowing the volume

output of an amplifier in watts, and the loss sustained by the transformation of the electric energy into sound energy, we will be able to calculate the energy emitted by the loud speakers.

3. Assuming we operate an arc of 60 amps. and 110 volts. The total energy consumed will equal  $W = V \times A$ , or  $W = 110 \times 60$ , or 6,600 watts, or 6.6 kilowatts. We arrive at the same result when using the formula  $W = R \times A^2$ .  $R$ , representing resistance, is in this instance 1.833 ohms

110

(—). The total energy is therefore 60

$W = R \times A^2$ , or  $W = 1.83 \times 60^2$ , or 6,598 watts.

## Motiograph's New Light Valve Control

By V. A. SCHOENBERG†

THE light valve control as used on the Motiograph De Luxe sound equipment is a means for the regulation of sound level by controlling the amount of light falling upon the light sensitive surface of the photo-electric cell, thereby controlling the amount of electrons emitted from the cell.

It is this particular feature that permits positive control of volume from a slight whisper to the maximum output of the amplifier system without any sacrifice of frequency response; by its use, the fader device is eliminated from the audio circuit thereby gaining the losses that normally are associated with such devices, such as frequency losses and absorption. Tests have shown that the number of stages heretofore used can be greatly reduced; also that frequencies never before heard are reproduced in naturalness.

The light valve proper consists of a mechanical means for increasing or decreasing the amount of light permitted to fall upon the cell; it is located within the sound aperture block and controlled at the machine proper. The control dial is over a range of 180 degrees graduated in a series of 15 steps. Its action permits an exceptionally even, smooth change which is gradual and not in steps of several db's which feature makes for ideal regulation.

Sound regulation by means of electronic emission control is the most logical position whereby sound reproduction should be regulated, as it eliminates from the audio circuit such devices as pads, faders and the like, and also permits the reduction in the number of stages required, the sound reproduction then is equal to that of amplifiers, speakers, and slit adjustment, whatever is recorded on the film, whether it be variable area or

variable density—it will be reproduced in accordance with the frequency response of the above-mentioned equipment.

Its use permits all stages of amplification to operate at an equal proportional amount, thereby overcoming the possibility of some stages (such as those in the head or pre-amplifier), being crowded and then having their output reduced to a suitable level so as not to over-modulate the first stages of the power amplifier. Usually the output of some head amplifiers is far in excess of the required amount for the input of the power amplifier. In such cases pads and the fader are used, acting as a dam, and also are used to regulate the input to the power amplifier for sound regulation. By eliminating such devices and regulating the amount of input to the head amplifier instead of regulating the output of head amplifier. It can readily be seen that the proper and only practical way of presenting sound as recorded is to regulate and control it at the cell proper.

Sound change-over is accomplished by means of a 4 and 3-way switch wired in the 500-ohm output circuits of the head amplifiers. These switches are conveniently located in the projection room. The light valve need not be adjusted once a level has been ascertained, only for such increase or decrease of volume as may be required during a screening of the film.

## Toronto Projectionists Rate High in Government Test

Toronto Projectionists have been "taking their exams" within recent weeks, and there is no need for the members of Local Union 173 to puff out their chests and tell the world how good they are—for the supervising examiners admit it, even before

†Engineering Dept., Enterprise Optical Mfg. Co.



all the papers have been corrected. The examination given covered completely the subject of motion picture projection, and, if we are to be guided by advices from Toronto, anyone gaining a good mark for the entire series of questions just is a Projectionist.

Appended hereto is a clipping from the *Toronto Globe* of April 10th last, sent in by H. N. Elliott of L. U. 173:

According to examinations so far held under the Provincial Treasurer's Department, the standard of efficiency of motion picture operators is very high. The operators have been under examination for some time past, and nearly all of them have passed the practical tests in the operation of sound and silent projecting machines. Over most of the Province, the written examinations for operators have also been held.

Yesterday, at the Parliament Buildings, the written examinations for Toronto operators began. Nearly a score of candidates took part in the examinations, which included difficult tests about the theoretic and practical phases of projection for both speaking and silent pictures.

The advent of sound pictures originally inspired these examinations for motion picture operators. The technique which the "talkies"

require for projection is far more complicated than that which the old silent pictures demanded, it is said. Hence the necessity for the examinations on physics, optics, chemistry, acoustics, etc., which made a score of young men chew ends of pencils yesterday from 9 o'clock in the morning till around 4 o'clock in the afternoon.

#### "High Standard of Efficiency"

Maybe it wasn't a matter of optics, acoustics, physics, etc. The contents of the examination paper were not divulged. But he did get this assurance from an official of the department: "The moving and talking picture operators of the Province have already shown a very high standard of efficiency." The same official told *The Globe* that most operators have been studying the theoretic and technical factors in their work very intensively these many months. They have even formed study groups and met together at regular intervals to wrestle with the intricacies of problems which might be presented at examination.

So the next time you see a "talkie" remember that Marlene Dietrich or even Greta Garbo are not the whole show. A good deal of the credit for the perfect enjoyment of the performance belongs to the man up in the projection room—and his midnight oil.

naturalness of the talking and singing selections and to the drum section of the orchestral selection. The bass notes of the piano selection will also sound unnatural if the lower frequencies are attenuated.

#### Rewinding Unnecessary

The two sound tracks are recorded from opposite ends of the film, so that when one sound track has been played, the reel on which the film has been taken up can be simply placed in the upper magazine and the film run through in the opposite direction, eliminating the necessity for rewinding.

It will be evident from the foregoing that a test film such as this must constitute a very valuable standard of comparison for determining whether any given installation is capable of affording sound reproduction of the high quality now essential. With a gauge of this kind, it is a comparatively simple matter to make a rapid and reliable determination of the chief operating characteristics of an installation. This makes the use of test films an important factor in the comprehensive servicing activities which Electrical Research Products carries on as an aid to its policy of keeping all its installations up to a high standard of performance.

## Noiseless Test Film Developed By ERPI

By T. L. DOWEY†

ELECTRICAL Research Products has always considered it a matter of prime importance that its installations should be so maintained that any noise accompanying sound reproduction was kept at a minimum, and certainly below the level at which such interference would become noticeable. With the introduction of Western Electric new process noiseless recording, this requirement became more important than ever, as the benefit of the new recording is, of course, lost unless there is practically complete absence of noise from the theatre sound system.

In order to make a dependable operating test on a sound reproducing equipment, it is necessary to have available, for service engineers and inspectors, sound recordings which are known to be good and which are sufficiently varied in character to test the capability of the equipment for properly reproducing various kinds of sound. For the purpose of testing film sound reproducing equipment in this way, Electrical Research Products has made a practice of using standard test films. These have, of course, been remade and improved from time to time to keep pace with the progress of the art. The type now being brought into use is made by

noiseless recording so that it can be used to test the fitness of a sound reproducing system to handle sound pictures made by the new method.

#### Use Double Sound Tracks

This newest form of test film has no picture but has two sound tracks, one including voice and music selections, and the other including several constancy frequency sections, ranging from 55 to 8,000 cycles, and a length of unmodulated—that is, blank track—for ground noise measurements.

The film serves a double purpose: first, it may be used to make a check of the general quality of reproduction by use of the track having a mixed voice and music recordings; second, it permits the frequency characteristics of a system to be determined by using the other track in conjunction with a volume indicator.

The presence of "flutter" may be detected by listening to the sustained notes of the singing and piano selections and to the constant frequency recordings. High frequency loss may be detected by listening to the high notes of the piano, violin and orchestral selections, and especially to the voice sibilance which should be present in the talking and singing selections. Low frequency reproduction may be checked by listening to the

## Wisconsin Bill Seeks One Man for Each Projector

A bill introduced in the Wisconsin assembly and referred to the committee on public welfare is the Westfahl bill which seeks to add a new section to the status providing that "there shall be not less than one projectionist of not less than 21 years of age for each projection machine used or operated." According to the bill it would be unlawful for an exhibitor to allow one projectionist to operate more than one such machine.

Violation of the proposed bill provides for a fine of not less than \$25 nor more than \$100, or imprisonment for a term not exceeding three months for the first offense and a fine of not less than \$100 nor more than \$500, or imprisonment in the county jail not exceeding six months, for the second offense. In addition the court may order the license of the theatre to be revoked.

At present there is no statute regulating projectionists and the exhibitors are strongly opposed to any sort of regulatory statute of this kind. The hearing for this bill was held on April 15 and a delegation of exhibitors was on hand to speak against it.

## Arnold Heads Cinematographers

John Arnold has been elected president of the American Society of Cinematographers, succeeding Hal Mohr. Arnold formerly was the treasurer of the organization.

†Engineering Dept., Electrical Research Products Co.



# Efficient Sound Reproduction

By R. H. McCULLOUGH

*Supervisor of Projection, Fox West Coast Theatres*

**I**N THE event of a power failure, during the time the sound reproducing equipment is in operation, always bring the fader to zero first, so that the unpleasant change of pitch, due to the projector motor slowing down, will not be heard by patrons in the auditorium. It is essential that the projector motor switch—also the amplifier switches—be in "off" position during a power failure. Should the power be off for such a time that the vacuum tubes become cool, if the power is resumed with the switches turned on, the tubes may be injured and various transformers, condensers and associated electrical equipment be damaged.

It is always advisable to turn all switches in "off" position during a power failure and when the power is resumed, turn them on in their proper sequence as it is essential to protect the equipment from damage.

## Making Fader Change-Overs

Never move the fader from zero before the projector motor has reached full speed, as this will completely spoil music or speech. When the motor is up to the proper speed, bring the fader slowly to the proper setting. When making change-overs, move the fader control as smoothly as possible and if you cannot make a complete change-over in one movement, stop at zero for a fresh grip.

Be careful not to move the fader control past the proper setting and then have to come back to it. The fader control should be kept at zero, when the theatre is open, except when testing with all theatre horns turned off.

## The Monitor Horn

With every sound installation, there is a monitor horn installed in the projection room, so that the projectionist may hear the sound which is being delivered to the auditorium. The volume of sound from the monitor horn must be kept at a certain level, so that the sound cannot be heard in the theatre auditorium.

Excessive sound from a projection room monitor horn will produce an effect similar to an echo in the rear of the auditorium if the projection room is not sound proof.

## Failure of 555-W Unit

Gun shots, cannon shots, bombs, blasting and other effects reproduced with increased volume have been the cause of replacing many receiver units. Audio current circulates through the actuating coil, interacted

with a steady magnetic field, forcing the diaphragm in and out. Most receivers, which are termed defective, have open speech circuits. When the speech circuit is open in a receiver unit, the trouble can usually be located at the internal connection of either L No. 1 or L No. 2. The loud speaker unit is very delicate and should be handled with extreme care.

Changing horn units is not a difficult job and it does not take an engineer to do this work. To replace the 555-W receiver unit, take off the wires on the four terminals and with a wrench provided loosen the nut attached and lift off the receiver. Replace it with one of the tested spares and be positively sure that each wire is connected to the same terminal on the new receiver as it was connected previously.

## Color Combination For Leads

If the wrong connection is made to receiver terminals, the quality of reproduction will be spoiled. When replacing 555-W receiver units, if the following color combination is adhered to, considerable trouble will be eliminated. A standard color combination is used between the terminal strip in the "B" box and the horn units to determine the correct polarity. The speech leads are connected to L-1 and L-2.

The color combinations for these leads are red and green. The red tracer, which is positive, should always be connected to terminal L-1 and the green tracer, which is negative, should be connected to L-2. The field coil leads are also polarized by color combination. The black lead is positive and should always be connected to terminal 7 V +. The plain white lead, which is negative, should always be connected to terminal 7V—.

## Charging Storage Batteries

A device used for furnishing direct or pulsating unidirectional current to a storage battery for the purpose of re-charging, is called a battery charger. The battery charger is like a pump and the battery is like a tank. The battery charger must be capable of maintaining a charging rate sufficient to keep the battery fully charged.

There are three principal types of alternating current battery chargers in use: the bulb type, the electrolytic type, and the vibrating type. Reference is made to the bulb type, because of its present use for re-charging storage batteries in connection with

sound equipment. The bulb type charger consists of a transformer connected to the supply line and a rectifying bulb of the argon type. The tungar bulb consists of a coiled filament of wire and a plate a little distance away from the wire filament. The filament is made of tungsten and the plate is made of graphite.

The air is drawn out of these bulbs and they are filled with very pure argon gas. In all cases the plate of the rectifying bulb is connected to the negative side of the battery to be charged, while the positive of the battery is connected to the tube filament through the transformer winding. Current for lighting the filament is taken from a part of the transformer winding.

## Overcharged Storage Batteries

It is extremely important that storage batteries should not be overcharged. Calculate the battery charging rate. Add the number of amperes drawn by all the tubes in the amplifiers with filaments or plates drawing current. Multiply the amperes by the number of hours of use and then add one quarter to this amount (to make up for battery efficiency). The result is divided by the number of amperes given by the charger.

The division shows how many hours the charger should be operated for the number of hours the amplifiers are in use. Check each tungar bulb before discarding. Be positively sure that the bulb and socket contacts are clean and free from corrosion, before ascertaining that the tungar bulb is dead. Frequently the base of the bulb makes an imperfect contact in the socket, and this causes arcing, with the result that in a short time the bulb ceases to function and goes out.

## Battery Operation

It is very essential that storage batteries receive the best of care and attention. With sound equipment the "A" type storage batteries are used to light the filaments of the amplifier tubes, to supply magnetising current to the receivers attached to the horns, and also to supply the current for the reproducer or exciting lamp filament.

The "A" battery has a terminal voltage of six volts and each battery has three cells of two volts each. Each cell is made up of several positive plates and several negative plates. All positive plates are connected together. The positive and



negative plates alternate with each other in position and are kept apart by separators of wood, celluloid or hard rubber.

The plates themselves are made of lead alloys and chemical compounds of lead. The plates and their separators are immersed in a bath of sulphuric acid diluted with water, this liquid being called the "electrolyte." The electrolyte and plates are carried in a jar, made of glass, hard rubber, or other insulating material. The positive plates have a dark, reddish brown or chocolate color; while the negative plates are gray or slate colored.

#### The Charging Action

When the batteries are connected to the amplifier and the filament switch turned on, an action immediately begins to take place between the plates and the electrolyte. A part of the sulphuric acid in the liquid combines with the lead in the plates to form lead sulphate, and the surfaces of both plates gradually become covered with this sulphate. The percentage of water in the electrolyte is increased because of the combining of part of the acid with the lead of the plates, leaving water in the electrolyte. The surfaces of the plates thus change slowly to lead sulphate, while the liquid becomes more nearly pure water.

When the battery is re-charged, the sulphate of the plates combines with part of the hydrogen and oxygen in the electrolyte to form more sulphuric acid. The positive plates then become peroxide of lead, and the negative is left as sponge lead. This transformation continues until the sulphate is completely reduced, and the battery is then said to be charged.

#### Loose Battery Connections

Noisy reproduction can many times be traced to loose battery connections. It is imperative that battery straps be soldered to the battery terminals so as to avoid any possible chance of corrosion. When a battery discharges, the current flows outside the battery, through the circuit from the positive terminal to the negative terminal. The direction of current flow inside the battery is from the negative plate to the positive plate.

#### Selected Technical Glossary

Appended hereto is the second installment of the selected technical glossary recently promulgated by the Academy of Motion Picture Arts and Sciences. It has been pointed out previously that there will inevitably be differences of opinion and recognized practice in the application of many terms, and therefore users of the glossary are cordially invited to call to the attention of the Technical Bureau of the Academy errors and suggested additions, so that by peri-

odic revision the glossary may be kept authoritative and up-to-date.

The first installment of this glossary appeared in the March issue; the next installment will appear in the June issue.

#### E

**EAGLE.** (1) An insect that flies across the set while the camera is operating, usually requiring that the scene must be done over again. (2) A perfect photographic take.

**EAR MUFFS.** Rubber cushions attached to the monitoring ear phones ("CANS") to shut out extraneous noises.

**ECONOMIZER.** Step-down transformer.

**EFFICIENCY, PHOTOGRAPHIC,** of a light source, is the ratio of that part of the light flux which the photographic emulsion will record, to the total light flux emitted.

**ELECTRODE.** Terminal of an electric device such as a cell or vacuum tube.

**ELECTROLYTE.** Liquid conductor of electricity, as in a battery.

**ELECTRON.** Unit of negative electricity, and smallest particle of matter, next to the proton. Radius, about  $2 \times 10^{-13}$  cm. (i.e., 0.000,000,000,000,2 cm.). Mass,  $9 \times 10^{-28}$  gram. Negative charge,  $1.6 \times 10^{-19}$  coulomb.

**ELECTRON TUBE.** Generally, same as VACUUM TUBE, THERMIONIC. May also refer to PHOTO-ELECTRIC CELL.

**ELECTROPLATING.** Process of depositing a metal on another metal by making the latter the cathode of a suitable solution through which an electric current is sent. The solution must contain a salt of the metal to be deposited.

**ELECTROSTATIC.** Pertaining to electric charges at rest.

**ELEPHANT EARS.** Small GOBOS.

**EMULSION.** The light-sensitive substance on a photographic film or plate, consisting of a gelatine containing a silver halide or nitrate. For its action, see EXPOSURE, and DEVELOPMENT, and FIXING.

**ENERGY DENSITY.** Quantity of energy contained in a given volume, divided by the volume.

**EQUIVALENT FOCUS** or **FOCAL LENGTH.** See **FOCAL LENGTH, EQUIVALENT.**

**ERG.** Unit of work or energy in the metric system. Approximately 13,560,000 ergs equal one foot-pound of work.

**EXCITER LAMP.** Light source used in reproducing sound from film.

**EXPONENTIAL HORN.** See **HORN, EXPONENTIAL.**

**EXPOSURE.** The placing of a photograph emulsion under the action of light. Quantity of exposure varies very nearly as the product of time and light intensity. The quantity of exposure determines the amount by which the silver halide or nitrate in the emulsion will be chemically changed ("reduced") to silver when the emulsion is developed. See **EMULSION** and **DEVELOPMENT.**

**EXPOSURE, DOUBLE.** See **DOUBLE EXPOSURE.**

**EXTENSION.** Stage cable with lugs on both ends.

**EXTINCTION COEFFICIENT.** Same as **DENSITY**, (1).

**EYE-PIECE.** Lens to which the eye is applied in any optical instrument such as a telescope or microscope.

#### F

**"F" SYSTEM.** System of marking lens diaphragm stops in terms of the focal length. Thus, an F:6.3 stop has a diameter equal to  $1/6.3$  of the lens focal length.

**FADER.** Potentiometer used to control volume of sound in reproduction, also that used to control intensity of the printer light.

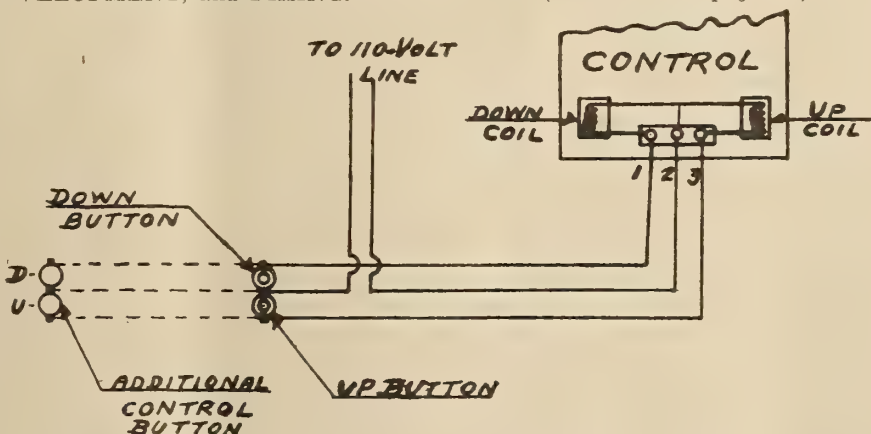
**FARAD.** Unit of capacitance. Capacitance of a condenser in which one coulomb will be stored by one volt. (The microfarad is the unit commonly employed in practice.)

**FAST.** Cf. **SPEED.**

**FAST FEED.** Mechanism used on a disc-recording machine to produce the starting spiral.

**FEAR PROCESS.** Method of re-

(Continued on page 33)



Wiring diagram for Strong remote volume control



## Letters to the Editor

### Ultra-Violet Light Source

IN THE November, 1930, issue appeared an announcement of a new-type lamp developed by Dr. J. W. Marden of the Westinghouse Lamp Co. Following a general description of this lamp, the following comment by Samuel Wein appeared:

Just why such a lamp cannot be used as an exciting lamp is the concern of the present article. It seems logical that any source of illumination so rich in ultra-violet rays, and with such a low rating, would find immediate application to sound motion pictures, particularly as an exciting lamp. It will be remembered that the greatest flow of photo electrons are had on exposing the photo-electric cell to a rich source of ultra-violet rays. Such being the case, a larger number of photo-electrons ought to flow as the result of exposing the cell to the lamp devised by Dr. Marden. A decided advantage of a greater photo-electron flow is that less amplification would be necessary, and, accordingly, less distortion would result.

Concerning which the following observations have been received from A. R. Dennington of the Vacuum Device Department of the Westinghouse Lamp Co.:

A copy of some comments made in the November issue of MOTION PICTURE PROJECTIONIST has just been brought to our attention. The suggestion has been made in the publication that a low wattage ultra-violet glow lamp might possibly find use as an exciting lamp for sound motion pictures. A lamp of this type will probably not be of any advantage for this particular service because the ultra-violet rays would be absorbed very largely by the film and the remaining ones would be almost completely absorbed by the glass envelope of the photo-electric cell.

In order to utilize the ultra-violet source it would be necessary to install a special photo-electric cell sensitive to ultra-violet; and any device of this kind gives a smaller photo-electric current than the usual gas-filled or vacuum type photo-electric cell. Therefore, at the present stage of development of photo-electric or photo-chemical devices there would be no advantage in using the ultra-violet source.

### Old Melies Films Stolen

Jean A. Le Roy, one of the pioneers of motion picture projection and a man who figured prominently in the early formative days of the International Alliance, requests publication of the following notice which he has sent out anent old Melies films:

It has come to my knowledge that certain persons are endeavoring to

dispose of the negative and positive prints of certain issues of the famous "Star" films, produced by George Melies, of Paris, France, in whom title to which still reposes and which were originally in the custody of Jean A. Le Roy, of New York City, until about 1920, when they were stolen. This will advise you that the rights and title to said films have never been sold, exchanged or otherwise disposed of by the owner, George Melies, whose legal representative and agent in America is Jean A. Le Roy and that prompt action under due processes of law will be taken to recover same and prosecute any one in whose custody the films may be found. Any effort to purchase, distribute, or exhibit said Melies "Star" films will be subject to the penalties prescribed by law.

This does not concern the Western pictures made by Gaston Melies, and for a time the American representative of George Melies, but only to the aforesaid "Star" films made in France by George Melies, title to which has never been transferred, sold or otherwise disposed of by him.

### "Superior Craftsmanship"

Under a similar heading there appeared in the April issue an editorial which set forth the necessity for constant education and which included reference to the progress being made in educational work in other crafts. This editorial elicited the following initialled comment from C. W., New York:

Your comments on "Superior Craftsmanship Pays" in the April issue are an insult to very member of the I.A.T.S.E., not only because you question the ability of these men but also because you cite in substantiation of your statements the progress attained by the electrical tradesmen. Your statement: "The I.B.E.W., generally regarded as one of the outstanding organizations of any type in the world subscribes wholeheartedly to the viewpoint that their men should get the work not merely because they are organized but because they are better craftsmen. And the I.B.E.W., let it be said, is getting results"—this statement implies that I.B.E.W. men are not only better craftsmen than are I.A. members but that they (I.B.E.W. members), should get *our* work. Even if you defend yourself by stating that you meant nothing of the sort but merely used the I.B.E.W. as an example of a group of modern craftsmen, you, who certainly are in a position to know about and understand prevailing conditions, should never have permitted yourself the liberty of making such statements.

Quite aside from the fact that we received many complimentary references to this particular editorial (the

writers of which would probably incur the displeasure of the craft if they were exposed), and the fact that explicit mention should have been made of the *type* (electrical), work which the I.B.E.W. solicits and gets, the editorial as written still represents our opinion. "Prevailing conditions" should not and do not impose any restriction on an honest expression of opinion; on the contrary, they rather make necessary such comment. Furthermore, outside of one or two big centers, no craft other than the I.A. has enough men qualified as competent projectionists to occasion serious concern.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of

### MOTION PICTURE PROJECTIONIST,

published Monthly at New York, N. Y., for April 1, 1931.

STATE OF NEW YORK } ss.  
COUNTY OF NEW YORK }

Before me, a notary public in and for the State and county aforesaid, personally appeared James J. Finn, who, having been duly sworn according to law, deposes and says that he is the Editor of MOTION PICTURE PROJECTIONIST, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and regulations, printed on the reverse of this form, to wit:

1. That the names and address of the publisher, editor, managing editor, and business manager are: Publisher, Mancall Publishing Corp.; 7 West 44th St., New York City; Editor, James J. Finn, 7 West 44th St., New York City; Managing Editor, none. Business Manager, Boone Mancall, 7 West 44th St., New York City.

2. That the owner is: Mancall Publishing Corporation, 7 West 44th St., New York City. Boone Mancall, 7 West 44th St., New York City.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is . . . (This information is required from daily publications only.)

JAMES J. FINN,  
Editor.

Sworn to and subscribed before me this 31st day of March, 1931.

NATHAN REIGROD,  
Notary Public.

N. Y. County Clerk's No. 55,  
Reg. No. 1R3

[Seal] (My commission expires March 30, 1933.)



## New Equipment and Appliances

### New Voltage Control Unit for Sound Systems

In order to obtain most satisfactory results from sound equipment of the type utilized in the amusement field and in hotels, apartments, and theatres it is essential that the input power to the amplifier be maintained constantly at the rated voltage. Although the various power transformers in an amplifier are usually equipped with primary switches so that the unit can be adjusted for any input voltage within certain limits, if there is a tendency for line voltages to fluctuate a master power control is essential.

A manually-operated line-voltage control unit of convenient size has just been announced by the American Transformer Company, of Newark, N. J. This unit was especially designed for the purpose described above, is for use in 50/60-cycle circuits, and consists of an adjustable auto-transformer with a meter for indicating the voltage supplied to the power circuits of the amplifier. The device will permit of maintaining the voltage at a constant value of 110 or 115 volts, as desired, and may be used where the existing supply is between 90 and 130 volts. Adjustment is accomplished by a special multi-point switch which increases or decreases the potential in 5-volt steps without opening the circuit at any time. It has an electrical rating of 750 va.

The AmerTran power control Type T-750 is housed in a compact sheet metal box designed for wall mounting. It requires a wall space of  $6\frac{1}{4}$ " by  $11\frac{1}{4}$ " and the overall depth is only 9". The meter employed is a 3" diameter flush-mounted instrument and the control is a large bakelite knob  $2\frac{1}{4}$ " in diameter.

### Resistor Data Booklet Ready

An engineering bulletin covering the remarkable features of the new Type "K" metallized resistors has just been issued by the International Resistance Company, 2006 Chestnut Street, Philadelphia, Pa. This bulletin not only deals qualitatively with such features as permanence, overload characteristics, humidity characteristics, load characteristics, voltage coefficient, ageing, temperature coefficient, radio frequency characteristics, noise and mechanical strength, but also includes ample quantitative data in its text and graphs. A copy may be had for the asking.

### Neumade "Fume-Tite" Cabinet

A practical demonstration of the fire resisting qualities of their "Fume-Tite" Film Cabinet, was given recently by Oscar F. Neu, president of Neumade Products Corporation, and was decidedly successful. The test procedure was as follows:

1. Demonstrating the explosive in-



Neumade  
"Fume-Tite"  
Film  
cabinet

flammability of nitrate cellulose motion picture film—which is the underlying reason for all precautionary measures which are required in the storage of nitrate cellulose film anywhere. . . . Only 2,000 feet of film was ignited. Inside the cabinet during all of the tests was 16,000 feet of film which could be ignited if the cabinet did not provide the protection expected of it.

2. Demonstrating the ability of the cabinet to withstand from the outside a fire much more intense than any which could reasonably be expected to occur in a theatre projection room. \* \* \* Inflammable material piled around the cabinet to completely envelop it was burned for fifteen minutes. . . . Sixteen thousand feet of film was inside the cabinet during this test.

3. Demonstrating the ability of the cabinet to confine within itself—and discharge through its vent pipe into the open air—the poisonous gases which are developed by the decomposition of nitrate cellulose motion picture film by intense heat or fire. . . . Sixteen thousand feet of film was ignited inside the cabinet with its precision fitted door closed. It is estimated that this amount of film generates a pressure of about 50 pounds to the square inch—quite sufficient to burst a cabinet of average construction and calculated to at least force some of the poisonous gases out through crevices where the door fits.

### Constructional Details

Construction features of this cabinet are as follows: Inside area at every point enclosed in double walls of full weight 18-gauge steel plate. Double walls  $1\frac{1}{2}$ " thick, tightly filled with most highly approved plastic fire-proofing compound. Precision fitted fume-tight door with sure-fire automatic three-point self locking de-

vice and never-failing plunger type, adjustable, self-closing door pull. Cubical contents 22" x 19" x 17" accommodating eight 2,000-foot reels of film. Sixty square inches of venting area directly from the cabinet and through a double walled steel vent pipe packed with fire-proofing compound.

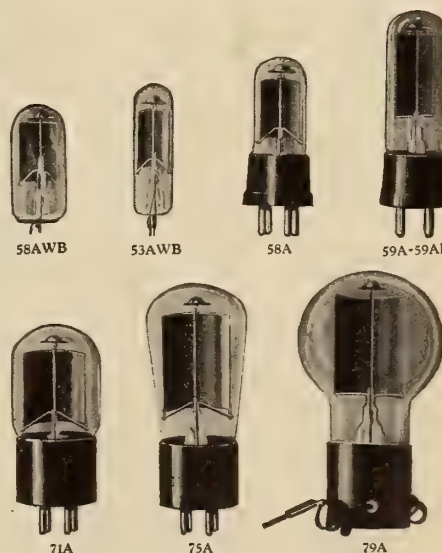
Tilted solid plate rack for reels, with rod separators and index card holders for reels. Humidifier—which provides easy practical means of applying moisture to stored film. All fittings and hardware heavy brass and chromium plated. Utility cabinet base 24" high, 24" wide, and 18" deep with three carbon compartments and two drawers for tools. Slanting top, easily removable, to discourage the tendency to use any flat surface in a booth or film room for miscellaneous storage. Unit type construction for use in pairs where fire and insurance regulations permit. Second cabinet with individual vent pipe on opposite side fits on top of the first one and slanting top works as a utility and decorative top.

The "Fume-Tite" Cabinet sells for \$225, plus installation cost and is the result of two years of research and experimentation.

### G-M's New Size Visitrons

G-M Laboratories, Inc., announce three new sizes of Visitron type "A" photoelectric cells. These additions bring the number of sizes and shapes of standard Visitron type "A" cells to a total of seven, which constitutes the most complete line of photoelectric cells manufactured in the United States.

There is a G-M Visitron suitable for use in every type of sound equipment manufactured in America. Their high sensitivity, low operating voltage, stability, and long life make



G-M Laboratories cell series



Visitrons a valuable component of all sound systems and industrial appliances of every kind in which light sensitive cells are used.

### New Metallized Resistors an Important Advance

After some eighteen months of rather constant work on the part of a large research department, the International Resistance Company announces a new Type "K" filament of remarkable properties, now being incorporated in metallized resistors. The net result of the research is a practically moisture-proof resistor handling a heavier load, with less voltage coefficient and noise, with less temperature coefficient, and, all in all, more rugged, durable and satisfactory for radio and delicate electrical applications.

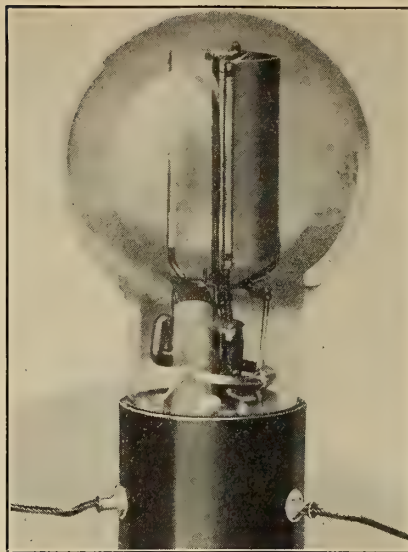
Under the most rigid laboratory tests, the new Type "K" metallized resistors show positive ability to withstand conditions of high humidity. No appreciable "ageing characteristics" are noted over long periods of time. The microphonic noise developed by the new type filament is very low even at full load. The resistance shows a negligible change with voltages up to and beyond normal rating. The voltage coefficient is very small, being less than 2% at voltages in excess of the rating of the unit, and at lower voltages it decreases still less. In fact, it is possible to measure the resistance at voltages anywhere from 0 to 200 volts, obtaining the same or pretty nearly the same resistance value at all times.

The change in resistance with load is very slight, averaging about 2½% decrease at rated voltage over the no load value, and decreasing to 5% at 100% overload. The temperature coefficient of resistance of Type "K" metallized resistor averages —0.04% per degree C. The resistance value of this resistor is independent of frequency, which is of great importance in many radio applications. The resistance remains the same on A. C. or D. C., and at any frequency.

### W. E. New 3-A Photocell Great Improvement Over Old Series

**W**ESTERN ELECTRIC has introduced a new photoelectric cell which is known as the 3-A. The first cell to be used by W. E. was the 1-A cell. This was replaced by the 2-A which embodied structural improvements over the 1-A. The 2-A now is replaced by the 3-A which has a number of improvements over its predecessors both physically and electrically.

The greatest difference lies in the use of caesium compound as the photo-active element instead of a preparation of potassium as used in the two earlier cells. The caesium oxide is coated on a half-cylindrical electrode and a small vertical rod forms the positive electrode. The former cells employed as the photo-active element a potassium preparation coated on the inside of the bulb,



New W.E. 3-A cell

with a ring-shaped member forming the positive electrode.

To appreciate the nature of the advantage gained by this change, it is necessary to consider the relation that exists between the characteristics of a photoelectric cell and the light used to operate it. In apparatus for reproduction from sound recorded on film, the most practical type of exciting lamp is a metallic filament incandescent lamp. Most of the light produced by sources of this type consists of yellow, red and infra-red radiations, there being comparatively little blue or violet radiation.

The sensitiveness of a photoelectric cell—that is, the current it will pass for a given amount of illumination—usually varies with the color of the illumination. In other words, the cell is more sensitive to some parts of the spectrum than others. In the case of the potassium cell, the sensitiveness was greatest for blue and violet radiation. The greater part of the light produced by the exciting lamp was therefore not utilized. The caesium cell, however, is highly sensitive to radiation within the range produced most abundantly by the exciting lamp—namely, yellow, red, and infra-red.

This results in the 3-A having much greater efficiency than the 1-A or 2-A. This greater efficiency is such that the output averages more than 20 decibels higher. Individual cells, of course, may show a gain less or greater than the average.

#### Aids Noise Reduction

A highly important advantage gained from this greater efficiency is the reduction in system noise which accompanies its use. The response from the cell being greater, the amplifiers can be operated with reduced gain, thus reducing the volume level of any noise producing element within the system. This makes the new cell an important factor in enabling sound reproducing equipments to do full justice to recordings made by the new noiseless process.

Besides output efficiency, there are other improvements to be found in the new cell, such as its ability to produce a more faithful electrical

copy or translation of the sound track; its ability to maintain its electrical and circuit characteristics unchanged and its immunity from rapid deterioration and loss of sensitiveness in storage or use.

Sufficient time has not yet elapsed to show what are the ultimate limits of service to be expected from the 3-A cell, but it may be said that whereas the life of the average potassium cell was from nine months to a year, or less if kept in too high a temperature, laboratory tests on the 3-A cell have shown no appreciable deterioration over a period of nine months, whether stored or operated.

At the time the potassium cell was put into service, such considerations as the foregoing made it, on the whole, the best available, despite its lower efficiency. A great deal of further development work was at that time necessary before the caesium cell could be brought to the point where it could be made commercially available in a satisfactory form. However, the completion of this work now provides in the 3-A cell a photoelectric unit which is not only much more efficient than the 1-A or 2-A cell, but is also more stable, has a much longer life both in storage and in use, and is immune to the effect of temperatures up to 125 degrees Fahrenheit.

### Pre-Cratered National Carbons

Another important improvement in projector carbons is announced by National Carbon Company, Inc. This is the "pre-cratering" of 9 mm x 20" National High Intensity Projector Carbons. Pre-cratering, as the name implies, consists in forming a crater at the burning tip of the carbon during the process of manufacture. In addition to the pre-cratered tip, the holder end of each carbon is beveled to permit easy insertion in the holder jaws. All 9 mm x 20" high intensity carbons now leaving the factory embody these improvements.

Pre-cratering gives better initial performance of the carbon in two respects. It results in clean burning when the arc is struck on a new carbon and it reduces the time required for the arc to burn in. Every projectionist will appreciate the importance of these features.

The advantages of this latest improvement in projector carbons have been conclusively demonstrated by exhaustive tests, both in the laboratory and in actual theatre projection.

### New Amplifier Equipment

Five items of associated equipment especially designed for use with AmerTran Series 80 power amplifiers have just been announced by the American Transformer Company. The new equipment is also arranged so that it may be used with other standard amplifiers having 500-ohm input circuits. The various units available are as follows: master control, Type C-81; master control with one-stage pre-amplifier, Type A-88; two-stage, low-level input amplifier, Type A-89; "A" power supply unit



(12-volt), Type P-78; and dynamic field supply unit, Type P-101.

It is the function of master control Type C-81 to control volume, to select signals from a 500—or 200-ohm source, and to regulate operating current to the 200-ohm source. The volume control is a 500-ohm constant-impedance, T-pad attenuator and the output impedance is 500 ohms. The Type A-88 master control with pre-amplifier is identical to Type C-81 except one-stage, low-level amplifier is connected in the 200-ohm input circuit.

Input amplifier type A-89 is for raising low-level signals to values sufficient for exciting the main amplifier. It employs two transformer-coupled stages utilizing d.c.-operated pedance of 500 ohms. It is available with a high-impedance or 500-ohm impedance input and is supplied in a compact metal case designed for wall mounting.

Power supply unit type P-78 has been designed to provide filament current for AmerTran d.c.-operated amplifiers, such as Type A-89. It has an output of 12 volts filtered d.c. at 1.75 amperes and operates from 110-volt, 60-cycle lighting circuits. Power supply type 101 is of similar design but provides an output of 7.5 or 15 volts at 1.5 amps. It will energize the fields of one or two dynamic loud speakers.

### "Series Z" Pacent Reproducer

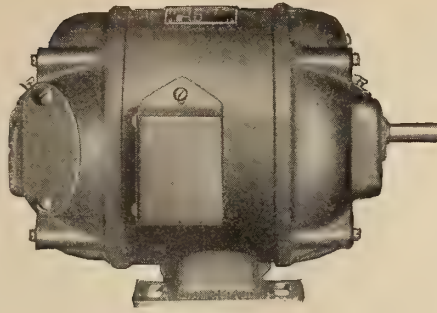
Stressing a saving to the exhibitor averaging more than 20 per cent, announcement has been made by the Pacent Reproducer Corporation of the new "Series Z" reproducing system. What is expected to be the most popular model in the line is the double projector sound-on-film installation at \$1,695.00. This new series equipment was specifically designed for the small house.

A feature of this new type equipment is the pre-focused optical system which will eliminate the necessity for lengthy adjustment by the projectionist. The entire optical system in the film head is pre-focused at the time of manufacture, and it includes a screw locking arrangement which permits removal of the lens barrel for cleaning, with perfect focus assured upon replacement without the need for considerable adjustment.

This new type equipment will be sold in accordance with the Pacent Company's outright sale and no compulsory service policy. Immediate delivery may be had.

### New Type Century Motors

Century Electric Company, of St. Louis, Mo., announces a new line of fractional horsepower motors having mounting dimensions interchangeable—in repulsion start, induction single phase, split phase, single phase, squirrel cage induction three phase, and DC types. The bearing brackets of this design offer unusual protection against falling objects, dirt, or



New Century Motor

dripping water. These motors have rolled steel frames, welded steel feet, slotted for belt adjustment, and bearings machined from phosphor bronze castings. They are equipped with the Century wool yarn system of lubrication.

### Visitrons Now Sold by N.T.S.

The National Theatre Supply Company has recently completed arrangements with the G-M Laboratories, Inc., for the exclusive distribution of Visitron photoelectric cells by direct-to-theatre sales. Coincident with this, the G-M Laboratories have enlarged their line of Visitron photoelectric cells so that they can now furnish photoelectric cells for all types of sound-on-film equipment.

The G-M Laboratories, Inc., are well-known as manufacturers of photoelectric cells, having furnished cells as long as five years ago to many of the pioneers in sound-on-film development. Since that time, Visitrons have been used by a large majority of the manufacturers of sound-on-film equipment, many of them using Visitrons today as standard equipment.

The new nation-wide distributing arrangement makes Visitron cells easily and quickly available at all supply centers throughout the country and should therefore appeal to exhibitors as another move for improved equipment and supply service.

### Camera Blimps Not Favored By Coast Technicians

The Producers-Technicians Committee of the Academy of M. P. Arts and Sciences held its regular quarterly meeting recently. The Committee heard reports on camera silencing, the standard release print survey, cue sheets, film processing, supersensitive film, and other technical developments in the industry. M. C. Levee presided.

At the meeting it was reported that sixty first cameramen, representing all Hollywood studios, had replied to the questionnaire sent out in March by the Camera Silencing Subcommittee. 91% of the replies advocate strong efforts toward the development of cameras which would require

blimps or covers of any sort. 52% of these replies urged such efforts in strong terms.

### Object to Weight and Bulk

The weight of the blimps in use was condemned by 90% of the replies; the bulk by 87%. 55% said the blimps made focussing difficult, and 73% said they crowded the sets uncomfortably on close-ups. Practically every type of camera cover in use in Hollywood was criticized for one or more of these reasons.

At the meeting it was resolved to bring this situation to the attention of the camera manufacturers and inquire what efforts are being made toward the production of a silent camera. The Committee will offer to have studio experts confer with the manufacturers in an endeavor to advance such efforts.

The Committee expressed its appreciation of the co-operation of the American Society of Cinematographers, and of the International Photographers Local 659 of the I.A.T. S.E. and M.P.M.O.

### Special S.M.P.E. Color Session

Dr. C. E. K. Mees, director of research for Eastman Kodak Co. and a ranking authority on photography, will preside at a special color photography session to be held during the Society of Motion Picture Engineers' spring meeting in Hollywood, May 25 to 29. At this session a number of papers will be given by leading authorities and specialists in the various color processes and outstanding examples of color photography will be shown.

### Veto Ohio Stench Bomb Bill

A bill providing heavy penalties for the throwing or possession of stench bombs in public places of amusement, passed by an overwhelming majority of the Ohio Legislature, has been vetoed by the Governor on the ground that the legislation is too loosely drawn and would discriminate against commercial organizations which rightfully possess and use stench bombs for protective purposes. The Governor said that such legislation was badly needed but that drastic changes in the construction of the bill would have to be made before he would approve it.

### New 'Labor Union' Incorporated

Papers of incorporation have been filed at Dover, Delaware, for the Independent Union Motion Picture Operators of America, "to organize and function as a labor union of motion pictures." No capital stock.

Resident agent is the Corporation Service Co., Delaware Trust Building, Wilmington, Delaware, with the following named as incorporators: S. L. Mackey, J. Skrivan, and H. Kennedy, all of Wilmington, Delaware.



## Everyday Science

### New Tests on Speed of Light

Elaborate preparations involving months of labor and thousands of dollars have been expended in preparation for the series of tests being conducted under the direction of Dr. Albert A. Michelson in California to accurately measure the speed of light. The tests as described by Prof. Henry G. Gale of the University of Chicago are as follows:

"The racing beam of light will leave one face of a 32-sided mirror and be reflected from another mirror one mile away. It will return to another face of the original mirror, which is rotating at a speed from 500 to 1,000 revolutions a second. The distance which the mirror has moved in the time the beam was on its way is an index of the speed of light. The width of the mirror sides has therefore been made accurate to within one part in a million."

"The track for the beam of light is a mile-long pipe line which has been built on a ranch near Santa Ana, Calif. One of the elements of uncertainty in the 1926 experiments in which a beam of light was raced on a forty-mile round trip between Mt. Wilson and Mt. San Antonio, from an eight-sided mirror, was the varying barometric pressure enroute. In the impending experiments a vacuum will be set up in the pipe line so that the pressure will be constant as well as the temperature. In the 1926 experiment, the speed of light as determined by Dr. Michelson, was 186,284 miles a second."

### 'Deadwood' in Societies

Of late, there has been some discussion in the technical press on deadwood in technical societies. Comments made in this connection have revealed some rather fantastic ideas of membership obligation, all of which prompts the question, "What is deadwood in technical societies? Is the member who fosters the ideals of an organization by paying his dues, but who for one reason or another does not take an active part in its activities, deadwood?" If so, then we are afraid that technical societies are composed chiefly of deadwood.

Men join organizations of one kind or another because they believe in the principles the organization stands for and the good it might accomplish. Many men know, before they join, that their own interests will not permit them to take an active part in the activities of the society, yet they feel that the organization merits their moral and financial support. So with

engineers, there are those who have reached the forefront of their profession, are very busy men, having little or no time for technical society activity, who yet feel it their duty to give moral support to an organization, representing their profession, by joining it. Would one call such members deadwood to the organization? On the contrary, do not such men, by their very membership, add prestige to the organization? The membership of men of that caliber is a big factor in selling the organization to the rank and file of the profession.

### Two Member Types Necessary

Every organization needs two kinds of members, namely, workers and sustaining members. Men who join an organization for the purpose of lending their moral and financial support constitute the sustaining membership of the organization. This class, as a rule, embraces by far the larger part of the membership. It would be humanly impossible for some engineers to become active in every society to which they belong. Is it to be argued then that because they are active in one society only their membership in the others is not worth while?

In every organization there is a certain group of members who by reason of their ability, position and economic freedom shoulder the responsibility of management of the organization. These men constitute the workers. In other words they are the machinery of the society. But who furnishes the power to keep that machinery in operation? Is it not the sustaining membership, or in the

*There have been many thousands of preachments telling workmen that it is their duty to be loyal to the company they work for. But a man can seldom be furnished actuating motives by telling him he ought to be actuated by them; any favorable response which may follow a preachment is most likely to be the result of motivations running back long before the preachment itself. The only way worth practical consideration is to attempt so to relate the environment to the man that the fullest possible range of desirable motives will operate within him. It is always possible that by preachments, forces actually the opposite of those desired may be set up as defense reactions. Loyalty is likely to be lost rather than gained by demanding or even by asking for it.—*  
HENRY DENNISON.

words of some, "the deadwood of the society?"

It is obvious that any organization, whether technical or otherwise, needs two kinds of members and that both are equally essential to the life of the organization.—*Professional Engineer*, February, 1931.

### Treat Food by Ultraviolet

Laboratories are being set up at the University of Cincinnati for the application to food of a new process to be known as "selective irradiation," discovered by Prof. George Sperti of the University as the result of breaking down ultraviolet rays and determining their specific characteristics, according to an announcement appearing in a recent issue of *Electrical World*.

Professor Sperti discovered that there is a critical wave-length at which biological and other reactions begin which effect changes in the taste, smell, consistency, etc., of food, but that wave-lengths considerably shorter result in the destruction of bacteria, formation of vitamin D, for instance, starting at a wave length of about 3,100 Angstrom units.

Striking applications of this discovery have followed. For example, milk can be irradiated under the new process without affecting its smell, taste or color, while its vitamin D content is increased. Orange juice can be treated after extraction so that it retains its original flavor for indefinite periods. Fermentation, yeast molds and various forms of food spoilage are checked. Refrigeration is not required as an auxiliary aid to these results.

### Probe Effects of Lightning

That lightning may strike dead by some mysterious ray or poison as well as by the electric stroke itself was suggested by M. E. Matthias, well-known French student of lightning effects, before a recent meeting of the Academy of Sciences in Paris. When lightning has struck a tree in a forest, M. Matthias argued, observers who see the spot afterward often report that leaves or branches of nearby trees and other plants are dead, as though blasted by extreme heat or by some other mysterious power. This is quite distinct from the effects of lightning itself in splitting tree trunks or in setting things on fire. Furthermore, this belt of death surrounding the spot where a lightning flash has struck is too broad to be blamed on the direct effects of the



lightning. Two theories are possible. One is that the intense wave of light or of ultraviolet rays which accompanies the flash is powerful enough to kill the living leaves, just as to be too near such a flash when it strikes may blind temporarily the eyes of a human victim. The other possibility is that lightning creates in the surrounding air some unknown chemical which is a poison.

In previous reports M. Mathias has suggested that lightning sometimes produces in the air an unknown explosive substance probably responsible for "ball lightning" and some other mysterious effects. Perhaps some chemical of this kind forms the imagined "lightning poison." Possibly this explains, too, the occasional instances of persons who die by lightning without the bodies showing any sign of electric shock.

### Secure Tremendous Throw With New Searchlight

Projection of light from a bulb only about five or six times larger than the ordinary tungsten lamp used in the home, so that a person five miles away is able to read a newspaper by its rays, was demonstrated recently. The demonstration was conducted by W. A. Pennow, airport and airway lighting engineer with the Westinghouse Electric & Manufacturing Company at Cleveland, Ohio.

The light was projected from a searchlight throwing a narrow beam over Lake Erie. The beam spread only slightly over its course, Pennow explaining that the spread was only twelve feet a mile. Thrown on the clouds the searchlight produced a round spot that looked about as big as a washtub.

#### Produces 1 3/4-Million Candlepower

"The searchlight is designed principally to aid aviation in determining the height of cloud banks," Pennow said. The searchlight, containing a 420-watt lamp, produces 1,840,000 candlepower. Four per cent is lost every 5,000 feet on a clear night. Light haze will absorb about 10 per cent a thousand feet. In heavy haze, the light can be seen a mile. Used in fighting fires, the searchlight can penetrate about every kind of smoke but the blackest pall."

### Discuss Color Measurement

In a paper delivered at the joint meeting of Optical Society of America and American Physical Society, Herbert E. Ives and E. F. Kingsbury declared that the use of the photoelectric cell as a substitute for the human eye in color evaluation still falls considerably short of attainment.

There are three general methods existing for the measurement of color by visual means, namely, trichromatic matching; measurement by hue, lum-

inosity and purity matching; and spectro-photometric analysis. Of these, the first and third only are susceptible to reduction by physical processes. In the measurement of color, moreover, the ideal instrument would be capable not only of giving precise discrimination of intensity values, but also would indicate these values upon a scale.

Despite the remarkable advances in the development of the photoelectric cell, the account declared, the device is not yet capable of fulfilling this ideal. Future use of physical methods of color measurement, it was pointed out in the paper, is dependent on development of general colorimetric methods; on the choice of conventions as to measuring conditions; and a realization that color alone does not completely describe many of the most important characteristics of colored surfaces.

### A Television Projector

Following rapidly in the footsteps of the motion picture art, the television technique is ready to step out of the peep-hole stage. The latest developments make possible the projecting of a television picture on a screen for the entertainment of small theatre audience, compared with one to six persons heretofore served by the usual television for home use.

The projector type television developed by the DeForest Radio Company comprises a special form of neon crater lamp in combination with a lens scanning disc. The lamp is arranged for ready adjustment so as properly to focus the extremely small source of light with relation to the lenses of the scanning disc. The lenses serve to project individual spots of light on a screen, one following another, in forming the horizontal lines with which the incoming pictures are woven. The lens disc is driven by a large synchronous motor which keeps in step with the television transmitter when employed on a common A. C. system. The entire assembly is carried on an adjustable tripod on rubber tired wheels.

It is possible to project pictures measuring two by two feet, with the television projector. The pictures are most pleasing, since the lens scanning disc provides sufficient diffusion to fade adjacent lines into each other, thereby getting away from the angular effects of the usual scanning system. Ample illumination is provided for good pictures in a darkened room.

### Effect of Light on Disease

The far-reaching effect which light has upon some inanimate objects, such as "photographic films and clothes, leads us to inquire into the relation which exists between light and living things. We know from daily observation that plants must have light in order to thrive and grow. A healthy plant brought into a dark room soon loses its vigor and freshness, and becomes yellow and

drooping. Plants do not all agree as to the amount of light they require, for some, like the violet and the arbutus, grow best in moderate light, while others, like the willows, need the strong, full beams of the sun.

But nearly all common plants, whatever they are, sicken and die if deprived of sunlight for a long time. This is likewise true in the animal world. During long transportation, animals are sometimes necessarily confined in dark cars, with the result that many deaths occur, even though the car is well aired and ventilated and the food supply good. Light and fresh air put color into pale cheeks, just as light and air transform sickly, yellowish plants into hardy green ones. Plenty of fresh air, light, and pure water are the watchwords against disease.

### What Are Micro-Organisms?

In addition to the plants and animals which we see, there are many strange unseen ones floating in the atmosphere around us, lying in the dust of corner or closet, growing in the water we drink, and thronging decayed vegetable and animal matter. Every one knows that mildew and vermin do damage in the home and in the field, but very few understand that, in addition to these visible enemies of man, there are swarms of invisible plants and animals, some of which do far more damage, both directly and indirectly, than the seen and familiar enemies. All such very small plants and animals are known as micro-organisms.

Not all micro-organisms are harmful; some are our friends and are as helpful to us as are cultivated plants and domesticated animals. Among the most important of the micro-organisms are bacteria, which include among their number both friend and foe. In the household, bacteria are a fruitful source of trouble, but some of them are distinctly friends. The delicate flavor of butter and the sharp but pleasing taste of cheese are produced by bacteria. On the other hand, bacteria are the cause of many of the most dangerous diseases, such as typhoid fever, tuberculosis, influenza, and la grippe.

#### Effect of Sunlight on Bacteria

By careful observation and experimentation it has been shown conclusively that sunlight rapidly kills bacteria, and that it is only in dampness and darkness that bacteria thrive and multiply. Although sunlight is essential to the growth of most plants and animals, it retards and prevents the growth of bacteria. Dirt and dust exposed to the sunlight lose their living bacteria, while in damp cellars and dark corners the bacteria thrive, increasing steadily in number.

For this reason our houses should be kept light and airy; blinds should



be raised, even if carpets do fade; it is better that carpets and furniture should fade than that disease-producing bacteria should find a permanent abode within our dwellings. Kitchens and pantries in particular should be thoroughly lighted. Bedclothes, rugs, and clothing should be exposed to the sunlight as frequently as possible; there is no better safeguard against bacterial disease than light. In a sick room sunlight is especially valuable, because it not only kills bacteria, but keeps the air dry, and new bacteria cannot get a start in a dry atmosphere.

### Magic Wand in Photography

Suppose we coat one side of a glass plate with silver chloride, just as we might put a coat of varnish on a chair. We must be very careful to coat the plate in the dark room—that is, a room from which ordinary daylight is excluded—otherwise the sunlight will separate the silver chloride and spoil our plan. Then lay a horseshoe on the plate for good luck, and carry the plate out into the light for a second. The light will separate the silver chloride into chlorine and silver, the latter of which will remain on the plate as a thin film.

All of the plate was affected by the sun except the portion protected by the horseshoe which, because it is opaque, would not allow light to pass through and reach the plate. If now the plate is carried back to the dark room and the horseshoe is removed, one would expect to see on the plate an impression of the horseshoe, because the portion protected by the horseshoe would be covered by silver chloride and the exposed unprotected portion would be covered by metallic silver.

### Function of "Developer"

But we are much disappointed because the plate, when examined ever so carefully, shows not the slightest change in appearance. The change is there, but the unaided eye cannot detect the change. Some chemical, the so-called "developer," must be used to bring out the hidden change and to reveal the image to our unseeing eyes.

There are many different developers in use, any one of which will effect the necessary transformation. When the plate has been in the developer for a few seconds, the silver coating gradually darkens, and slowly but surely the image printed by the sun's rays appears. But we must not take this picture into the light, because the silver chloride which was protected by the horseshoe is still present, and would be strongly affected by the first glimmer of light, and, as a result, our entire plate would become similar in char-

acter and there would be no contrast to give an image of the horseshoe on the plate.

### The "Fixing" Process

But a photograph on glass, which must be carefully shielded from the light and admired only in the dark room, would be neither pleasurable nor practical. If there were some way by which the hitherto unaffected silver chloride could be totally removed, it would be possible to take the plate into any light without fear. To accomplish this, the unchanged silver chloride is got rid of by the process technically called "fixing"; that is by washing off the unreduced silver chloride with a solution such as sodium thiosulphite, commonly known as hypo.

After a bath in the hypo the plate is cleansed in clear running water and left to dry. Such a process gives a clear and permanent picture on the plate.

### Arcturus Photolytic Cells

So popular has proved the principle of the Arcturus photolytic cell that insistent demands have been made upon the Photo-Electric Division of the Arcturus Radio Tube Company, Newark, N. J., manufacturers of this device, to produce two

additional cells of different sizes to be utilized in equipment where space is limited.

Two new cells designated as Arcturus type P-23 and P-27 have been placed into production. The P-23 is a tubular type of cell, 2 5/8" high x 1 5/32" wide. The P-27 type of cell is considerably reduced in overall size, measuring 1 5/16" high x 1 1/16" wide.

While the overall size has been changed, the photo-sensitive surface area is identical to that of the well-known type P-4 photolytic cell which was introduced by Arcturus more than a year ago. The same inherent advantages of Arcturus cells are maintained in these two new cells.

Because of the ruggedness and principle of the photolytic cell these units are non-microphonic and require no polarizing potential. Background noise is entirely eliminated and because of the extremely low impedance of these cells there is no pick-up of parasitic noises. The high sensitivity of these cells provides an exceptional audio frequency response which is characteristic of the photolytic principle.

A new folder describing the complete line of photolytic cells has just been issued. Copies may be had upon request to the Photo-Electric Division of Arcturus.

## Common Sound Reproduction Troubles

ALL AMPLIFIER troubles have their causes, and every ailment displays some effect. Troubles do not occur in groups. They are mostly singular, unless a certain ailment closely allied with potential in the amplifier affects the system so that some other portion of the amplifier parts will be damaged. About fifty per cent. of amplifier troubles are due to vacuum tube failures.

If there is no sound of any kind when the switch is turned on, look at the tubes to see whether they are all lighted. If any tube shows less than normal brilliancy, try another tube in this socket; if this tube gives the same effect, then check the circuit wiring. Some amplifiers have their vacuum tube filaments connected in series. If one tube burns out they all go out.

Usually there is a milliammeter connected in the circuit with the vacuum tube filaments connected in series. If one of the vacuum tube filaments burn out, the indicated value on this meter would immediately drop to zero. The filament of the vacuum tube is the source of electrons and the most common trouble is a burned out filament.

### Open Circuits

Some amplifiers employ a variable rheostat in the filament circuit for

the purpose of controlling the flow of current through the vacuum tube filaments. Open circuits sometimes occur in rheostats. This trouble usually occurs where the rheostat slider makes contact with the resistance wire. The cause for the resistance wire burning out, where the slider makes contact, has been determined by the slider becoming accidentally bent and not making perfect contact, which causes very high resistance at this point of contact.

If the rheostat makes a crackling or scratchy noise while being adjusted, this noise can somewhat be eliminated by rubbing a soft lead pencil over the resistance wire where the slider makes contact. A lead pencil contains a certain amount of graphite, which serves as a very good lubricant for such working parts. After the lead pencil is rubbed slightly over the rheostat winding where the slider rotates, as suggested, it is necessary to rotate the slider a few times in order to distribute the lead evenly.

### Distorted Sound Reproduction

If Movietone sound reproduction is distorted, check the alignment of the photo-electric cell.

It is imperative that the full beam  
(Continued on page 39)



## Technical Glossary

(Continued from page 25)

**CORDING** and projecting wide pictures, by photographing on standard film through an optical system that turns the image through a right angle, so that the image on each frame lies along the length of the film instead of across the film. The frames can be longer than standard, thus permitting a width and height of picture greater than standard. In projection, another optical system is used to reverse the 90° rotation.

**FEED REEL.** Reel of film which has not yet passed the aperture.

**FIELD, MAGNETIC.** See **MAGNETIC FIELD**.

**FIELD OF VIEW.** See **VIEW, ANGLE OF**.

**FIELD RHEOSTAT.** See **RHEOSTAT, FIELD**.

**FILAMENT.** Heated wire from which electrons are emitted in a vacuum tube.

**FILAMENT BATTERY.** Same as "A" BATTERY.

**FILAMENT RESISTANCE.** Rheostat controlling current through filament of a vacuum tube.

**FILM** (noun). A celluloid strip coated with a light-sensitive photographic emulsion.

**FILM** (verb). To reproduce a scene or series of scenes on film.

**FILM GATE.** Movable element

which when in operating position, holds the film in proper position against the aperture plate.

**FILTER.** An apparatus or instrument to remove or weaken certain frequencies in a beam of sound, light, radio, or alternating-current waves, or mechanical vibrations. Particularly (1) colored glass or celluloid used in photography to filter out certain rays of light; or (2) a selective circuit network, designed to pass currents within a continuous band or bands of frequencies or direct current, and substantially reduce the amplitude of currents of undesired frequencies.

**FILTER, BAND-PASS.** A filter designed to pass currents of frequencies within a continuous band limited by an upper and a lower critical or cut-off frequency and substantially reduce the amplitude of currents of all frequencies outside of that band.

**FILTER, HIGH-PASS.** A filter designed to pass currents of all frequencies above a critical or cut-off frequency and substantially reduce the amplitude of currents of all frequencies below this critical frequency.

**FILTER, LOW-PASS.** A filter designed to pass currents of all frequencies below a critical or cut-off frequency and substantially reduce the amplitude of currents of all frequencies below this critical frequency.

**FIRE-TRAP.** See **MAGAZINE VALVE**.

**FIRST PHASE.** Initial inter-

locking of all recording machine and camera motors, so that they will be synchronized.

**FIXING.** After development of a photographic emulsion, it is fixed, i.e., immersed in a solution (generally **HYPO**) to remove the unreduced silver salt, thus making the emulsion immune to further effect from light. See **EXPOSURE** and **DEVELOPMENT**.

**FLAT.** Same as **TORMENTOR**.

**FLICKER** occurs when the number of pictures shown on the screen per unit time is not sufficient to insure complete **PERSISTENCE OF VISION**.

**FLICKER SHUTTER.** See **SHUTTER, FLICKER**.

**FLUTTER.** A type of pulsation of intensity in reproduced sound. See **WOW-WOWS** for explanations.

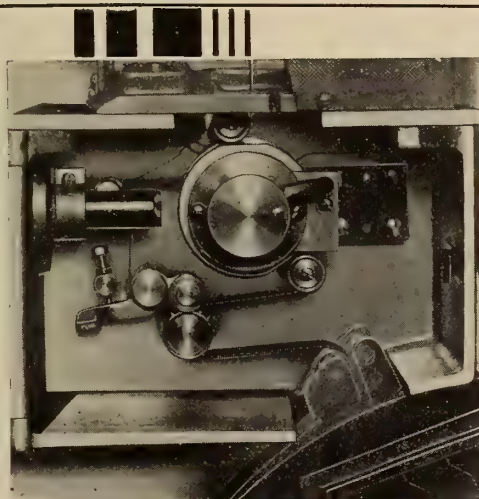
**FLUX, LIGHT** or **LUMINOUS.** See **LUMINOUS FLUX**.

**FLUX, MAGNETIC.** See **MAGNETIC FLUX**.

**FOCAL LENGTH.** Distance from the center of a lens to the focal point.

**FOCAL LENGTH, BACK.** See **BACK FOCAL LENGTH**.

**FOCAL LENGTH, EQUIVALENT.** Calculated focal length of a combination of lenses or of a thick lens. Equals the focal length of such a simple thin lens as would give an image (of a distant object) the same



- ¶ Light beam less than .0005
- ¶ H.A. impedance output will be matched to your present main amplifier
- ¶ Disk to film change-over
- ¶ Shielded P.E. cell
- ¶ For all type projectors

Price on Request

# "SYNCROFILM"

SOUND-ON-FILM REPRODUCTION  
OF THE HIGHEST QUALITY

1. **SIMPLICITY OF DESIGN**, engineered by men who have studied and overcome the intricate problems of a fool-proof sound head with matched pre-amplifier.
2. **TRUE TONE QUALITY**, faithful reproduction of variable area, variable density, squeeze track by means of a super-condensed optical system that is unique and fully covered by patents.
3. **LATEST DEVELOPMENTS**, precision workmanship, wearing surfaces chromium plated, silent chain drive, even tension takeup thru aperture, in short . . .  
No one could ask for more!

## WEBER MACHINE CORP.

59 RUTTER ST., ROCHESTER, N. Y.  
EXPORT DEPT.  
15 LAIGHT ST., N. Y. C.

CABLE ADDRESS  
"ARLAB" NEW YORK



# Bring On Your Tough Projection Jobs!

# STRONG

## High Intensity Automatic Reflector Arc Lamps

PROVIDE AN ABUNDANCE OF  
CRISP WHITE LIGHT

For Sale By Independent Supply Dealers

### The Strong Electric Corporation

2501 Lagrange St., Toledo, Ohio

Export Office: 44 Whitehall St., New York, N. Y.

# F. S. C.

## GENUINE OPTICAL CROWN GLASS PLATES

Enclose all Portholes for Sound Films and Shut Out the Disturbing Noise of the Projection Room.

*No Distortion*

*No Loss of Light*

### FISH-SCHURMAN CORPORATION

45 West 45th Street

NEW YORK CITY

size as the combination or thick lens gives.

**FOCAL PLANE.** The plane perpendicular to the optical axis of the lens at the focus.

**FOCAL POINT.** Point at which a lens forms the sharpest image of a very distant object.

**FOCUS (noun).** The point at which a lens produces the smallest image of a point object at a given distance. Also used for FOCAL POINT or for FOCAL LENGTH.

**FOCUS (verb).** To adjust the position of a lens so as to secure the sharpest possible image of an object.

**FOCUS, BACK.** See BACK-FOCUS.

**FOCUS, EQUIVALENT.** See FOCAL LENGTH and FOCAL LENGTH EQUIVALENT.

**FOCUS, DEPTH OF.** See DEPTH OF FOCUS.

**FOCUS, OUT OF.** Of a camera lens: not properly focused, producing a distorted image.

**FOCUS, PRINCIPAL.** The focus for an object at an infinite or very great distance.

**FOCUS, SOFT.** Device to obtain an image not sharply defined, by (1) placing gauze on the camera lens, (2) use of a specially ground lens.

**FOG.** Darkening of photographic film due to its exposure to undesirable light, or due to poor emulsion or to improper development.

**FOOTAGE.** Film length measured in feet.

**FOOT-CANDLE.** Unit of illumination of surface. The average illumination of a surface, measured in foot-candles, equals the LUMINOUS FLUX (expressed in LUMENS) falling on the surface, divided by the area of the surface in square feet.

**FRAME (noun).** A single rectangle of the series on a motion picture film.

**FRAME (verb).** To bring a frame into register with the aperture during the period of rest in recording, printing, or projection.

**FRAME LINE.** Dividing line between two frames.

**FRAME LINE NOISE.** Noise in reproduction, due to the displacement of the film to the right in the projection machine, so that the beam of light for the sound track shines through part of the picture area as well, and cuts the frame lines. This noise is a type of MOTOR-BOATING.

**FRAMING DEVICE.** An attachment on the projector which allows the operator to FRAME the picture properly.

**FREAK.** Slang for FREQUENCY.

**FREE PATH, MEAN.** See MEAN FREE PATH.

**FREQUENCY.** Number of cycles



(complete vibrations) per second in a wave or other regular recurring phenomena.

**FREQUENCY, AUDIO.** See **AUDIO FREQUENCY.**

**FREQUENCY, NATURAL.** See **NATURAL FREQUENCY.**

**FREQUENCY, RADIO.** See **RADIO FREQUENCY.**

**FRILLING.** Separation of the emulsion from the **BASE** at the edges.

**FRINGE.** Refers to overlapping of colors in color photography.

**FROZEN.** Of carbon electrodes, means fused together so that lifting mechanism cannot pull them apart and so strike the arc.

**FRYER.** A large electric lamp, usually used in connection with color photography.

**FUNDAMENTAL.** Lowest natural frequency of oscillation for a sounding body or for an electric circuit.

**FUZZY.** (1) Of sound track on visual inspection: lack of sharpness. (2) of reproduced sound: characterized by distortion, particularly of high frequencies. The distortion may have been introduced in recording, processing or reproduction.

## G

**GAFFER.** Electrician in charge of a group of electrical workers.

**GAIN.** Gain of energy in an apparatus is ratio of output to input energy.

**GAIN AMPLIFIER.** Any amplifier which handles comparatively small amounts of energy, as in the initial stages of a sound recording system. Specifically, the first amplifier used in disc reproduction for amplifying the varying current from the magnetic pickup or the first amplifier after the photoelectric cell amplifier, for the purpose of further amplifying the varying currents, in sound-on-film reproduction.

**GAIN CONTROL.** Device for varying the gain of an amplifier.

**GALVANOMETER.** An instrument for measuring electric current strength (or for detecting a small current, and determining its direction), generally by the deflection of a needle due to the magnetic field caused by the current.

**GALVANOMETER, STRING.** Utilizes a conducting wire or ribbon vibrating in a strong magnetic field according to the variations of the conducted current.

**GAMMA.** Slope of the straight portion of the **CHARACTERISTIC CURVE** of a photographic emulsion; measure of the contrast of the emulsion.

**GARGLE.** A type of pulsation of intensity in reproduced sound. See **WOW-WOWS** for explanation.

**GATE, FILM.** See **FILM GATE.**

**GATE, SOUND.** See **SOUND GATE.**

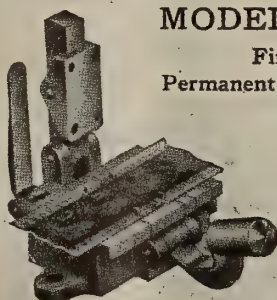
(Continued on next page)

# TWICE AS FAST!

**AT LEAST** *twice the speed of ordinary emulsions....* that is the greatest distinguishing trait of Eastman *Super-Sensitive* Panchromatic Negative. And along with doubled speed comes a combination of qualities never before assembled in a motion picture film. In this remarkable new negative film Eastman makes another notable contribution to the advance of the motion picture industry. Eastman Kodak Company, Rochester, N. Y. (J. E. Brulatour, Inc., Distributors, New York, Chicago, Hollywood.)

**EASTMAN SUPER-SENSITIVE**  
Panchromatic Negative, *Type 2*

## Universal Film Splicing Machine



**MODEL NO. 3** Pat. March 22:22

First-Class Results on New or Old Film  
Permanent Gauge No Adjusting

**FOR THEATRES, EXCHANGES  
LABORATORIES, SCHOOLS**

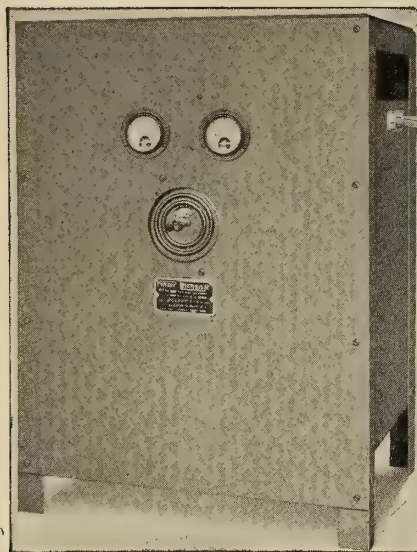
**Price \$6.00**

**GENERAL MACHINE CO., INC.**  
816-826 East 140th St., NEW YORK, N. Y.

For sale by all Supply Dealers



## Good Projection Requires Good Rectification



M. P. 25-25

## Good Rectification Means FOREST RECTIFIERS

**T**HIS Forest Rectifier meets the demand for a single unit to supply direct current for two projectors, and will furnish 15 to 25 amperes to either projector continuously.

It supplies a steady direct current, free from pulsations, and will produce a better light than other current supply devices. The only wearing parts are the bulbs which will last at least one thousand hours and usually much longer since only two bulbs are being used at a time (except during change over) and the load is alternately carried first by one set of two tubes then the other two as the projectors are alternately used.

This Forest Rectifier embodies the use of four rectifier tubes which are connected to supply current to two direct current circuits independent of each other, thus preventing loss of current at the first arc when the second arc is struck.

Both arc can be operated at the same time during the change over period and there will be no diminishing of the light from one projector while lighting up the second.

Two Ammeters are mounted on the unit which will show at a glance the amperage being used at either arc.

Links are provided for operating from 110-220 or 240 volts.

Rectifiers for all purposes made in 15 amp., 25-25 amps., 30, and 65 amps. sizes.

*We are specialists in our field. Send us your technical problems. Literature on request.*

## FOREST ELECTRIC CORP.

New and Wilsey Sts.

Newark

N. J.

**GENERATOR.** See DYNAMO.

**GENEVA MOVEMENT.** Intermittent movement (produced by a cam-and-star wheel) used in most projection machines.

**G. E.'S (Solloq.)** Generally, same as INKIES.

**GIVE 'EM A C!** To start synchronization of camera and recording motors.

**GLASS WORK.** Trick photography in which pictures on glass are used to replace parts of the setting.

**GLOW LAMP.** Lamp containing gas which, when the voltage across the lamp reaches a certain ("critical") value, conducts an electric current and in doing so emits light.

**GOBO.** Portable wall covered with sound-absorbing material. Not intended to be photographed.

**GOESOVER.** A shield for a camera lens to protect against top light.

**GOVERNOR MOVEMENT.** Mechanism which controls the automatic shutter. See SHUTTER, AUTOMATIC.

**GRAINS.** Refers to the tiny clusters of silver grains on a developed photographic film. See DEVELOPMENT.

**GRAM.** Metric unit of mass. Approximately 454 grams equals one avoirdupois pound.

**GRANULARITY.** Coarseness in the silver grains in a developed photographic image.

**GRAPHITE (noun).** Soft form of carbon. Used as a lubricant.

**GRAPHITE (verb.)** To cover a surface uniformly with graphite (which is a conductor) so that the surface can be electroplated.

## FOR EVERY TYPE of SOUND-ON-FILM EQUIPMENT

There is a Visitron Photoelectric Cell for every make of Sound-on-Film Equipment. Visitrons are outstanding for High Sensitivity, Long Life, Freedom from Trouble, and Economy. Order them from your nearest Branch of the National Theatre Supply Company.



# VISITRON

PHOTOELECTRIC CELLS

REG. TRADE MARK

GM LABORATORIES INC

1735 BELMONT AVE. CHICAGO, ILL.

**GREEN LIGHT.** In certain studios, signal that stage is ready for a sound take.

**GRID.** In a vacuum tube, the frame of wire gauze between the filament and plate. Small changes in the electric potential of the grid circuit produce far greater changes in the electron flow from filament to plate.

**GRID BATTERY.** Same as "C" BATTERY.

**GRID LEAK.** Very high, non-inductive resistance, usually connected across a condenser in the grid circuit of a three-electrode vacuum tube, to stabilize the action of the condenser (in making the tube more efficient) by permitting excess charge to leak off.

**GROUND GLASS.** Glass ground or sand-blasted on one side, so that it is no longer transparent, although still translucent (i.e., transmitting light diffusely); used for a focusing screen.

**GROUND NOISE.** Undesirable noise appearing in reproduced sound, due to film grain, amplifier noises, etc.

## H

**HALATION.** Blurring about a brightly-lit part of the picture, due to the lateral spreading of light in the film, or to reflection, or to improper development.

**HALIDE.** May mean bromide, chloride iodide, or (though not generally) fluoride.

**H AND D CURVE (H and D Curve).** The CHARACTERISTIC CURVE of a photographic emulsion. (Hurter and Driffield Curve.)

**HARD.** Of a vacuum tube, thoroughly evacuated.

**HARD LIGHTS.** (1) Arc lights. (2) Illumination from arcs, in general. Refers to the sharp shadows cast.

**HARDENER.** Solution used to harden photographic emulsion.

**HARMONIC.** Same as PARTIAL.

**HARMONIC CAM MOVEMENT.** Common type of intermittent movement for motion picture cameras.

**HARVEY METER (Harvey Meter).** Mechanical calculator designed to give the correct exposure when set for the various conditions which effect the quantity and quality of light.

**HAT, HIGH.** A very low camera stand.

**HEAD, SOUND.** See SOUND HEAD.

**HEYDE METER (Heyde meter).** Light meter for determining desirable exposure.

**HIGH HAT.** A very low camera stand.

**HIGH LIGHT.** Object, scene, or picture having low color saturation, that is, containing a large proportion of white.



**HIGH-PASS FILTER.** See **FILTER, HIGH-PASS.**

**HOOD, LENS.** See **LENS HOOD.**

**HOOK-UP.** Diagram of an electrical circuit; or, the construction of such a circuit.

**HORN.** Loud-speaker of either horn or cone type.

**HORN, CLICK YOUR!** Tickle the playback needle (before starting a playback; to produce clicks in the horn as a test of whether or not the circuit is complete).

**HORN, DROP THE.** See **DROP THE HORN.**

**HORN, EXPONENTIAL.** Type of loudspeaker horn in which the cross-section area increases exponentially with the axial distance from the diaphragm, so that cross-section areas, taken at equal intervals along the axis, have a constant ratio each to the next.

**HOT.** Electrically charged, particularly when dangerous.

**HURTER AND DRIFFIELD CURVE** (Hurter and Driffield Curve.) Characteristic curve of a photographic emulsion. See **CHARACTERISTIC CURVE.**

**HYPER-.** Prefix meaning excessively.

**HYPO.** Sodium thiosulphate, used for fixing photographic emulsion. See **FIXING.**

**I**

**IMAGE.** The effect produced by a definite aggregation of light rays coming directly or indirectly from an object or group of objects, and determined in form and color by two factors: the original object, and the mediums which have transmitted the light rays. A mirror forms an image of any suitably placed object; so does a lens, so does any **OPTICAL SYSTEM.** Images may be larger or smaller than the object; may be inverted or not; and may or may not have various distortions. The human eye can see by virtue of the fact that the eye is an optical system which forms a **REAL IMAGE** on the retina. (This image is actually inverted, but is re-inverted by the brain in the process of interpretation.) Compare **IMAGE, REAL,** and **IMAGE, VIRTUAL.**

**IMAGE, AERIAL.** Image in space formed by an optical system.

**IMAGE, LATENT.** See **LATENT IMAGE.**

**IMAGE, REAL.** Image through which the light rays actually pass, such as the image formed by a lens on the ground glass or photographic film of a camera. Compare **IMAGE, VIRTUAL.** Real images are always inverted.

**IMAGE, VIRTUAL.** An image through which the light rays do not actually pass, e. g., the image formed by an ordinary plane mirror behind the mirror, the rays being reflected from the mirror in such a manner that they appear to the eye to come from behind the mirror. Such an image cannot be shown on a ground-

glass screen as can a real image (cf. **IMAGE, REAL**), nor can it by itself produce a photographic action. (You can photograph the virtual image formed by a mirror, but you have to use an additional optical system—you cannot simply put the film behind the mirror where the virtual image is.) Virtual images are never inverted.

**IMBIBITION.** Absorption of dye by gelatine on a film, in color printing.

**IMPEDANCE.** (1) Effective opposition of a circuit to current, due to the resistance and reactance of the circuit. Equals voltage divided by current. In a d-c circuit, impedance equals resistance. (2) Similarly, a load or opposition to the transmission of mechanical or sound energy.

**IN-AND-OUT MOVEMENT.** That part of the intermittent movement in a motion picture camera which moves the claws in and out of the film perforations.

**INCIDENCE, ANGLE OF.** See **ANGLE OF INCIDENCE.**

**INDEX OF REFRACTION.** See **REFRACTION, INDEX OF.**

**INDUCTANCE.** (1) Magnetic flux of any part of an electric circuit, divided by the current producing the flux. A measure of the magnetic opposition to any growth or decay of current. Inductance is of two kinds: self-inductance, due to the current in the circuit itself, and mutual inductance, due to currents in other nearby circuits. See also **REACTANCE, INDUCTIVE.** (2) A choke coil, or

#### THEATRE EQUIPMENT

##### NEW AND USED



Sound Equipment, Moving Picture Machines, Screens, Booths, Opera Chairs, Spotlights, Stereopticons, Film Cabinets, Portable Projectors, M. P. Cameras, Generator Sets, Reflecting Arc Lamps, Carbons, Tickets, Mazda Lamps and Supplies.

Projection Machines repaired and overhauled. Repair parts for all makes opera chairs. Attractive 3 x 10 ft. muslin banners, \$1.50; on paper, 50 cents.

We Pay Highest Prices for Used Projection Machines, Opera Chairs, etc.

Everything for the Theatre—Write for Catalog K.  
**MOVIE SUPPLY CO., 844 So. Wabash, Chicago.**

## THE BIOSCOPE

The Leading Journal of the  
British Cinematograph Industry

20th Year of Weekly Publication

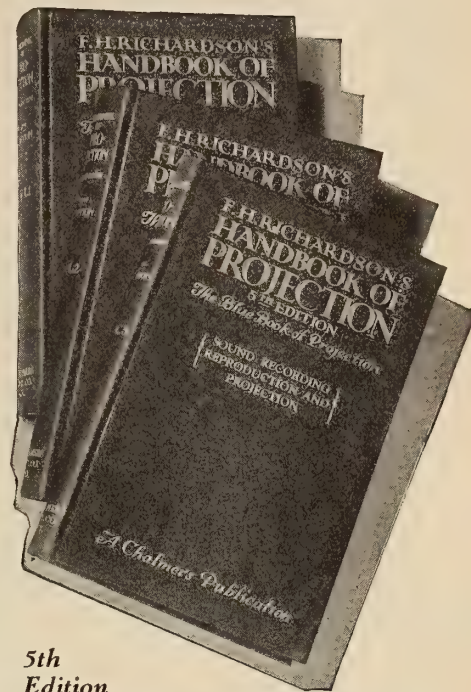
Contains a complete section each week  
for the special benefit of Projectionists.

Cash prizes awarded for original ideas  
published. Specimen copies 18 cents.

Annual Subscription 7 dollars 50

**THE BIOSCOPE PUBLISHING CO., Ltd.**  
8-10 Charing Cross Road,  
London, W. C. Eng.

## THE BEST SELLER



5th  
Edition

## HANDBOOK OF PROJECTION

By F. H. Richardson

Back in 1910 Mr. Richardson wrote the first Handbook of Projection. It was a sell out. Second, third and fourth editions, each bigger and more successful have followed. The present fifth edition in three separate volumes, illustrated above, is the culmination of years of intensive effort.

Richardson is no swivel chair author. He knows the problems of the field—meets the men on their own ground. His books reflect a practical knowledge of just what information is needed. Recently he completed a 17,000 mile trip through the U. S. and Canada in the interests of projection.

### CONTENTS

Volumes I and II are devoted entirely to the general subject of projection and everything related to it. Volume III deals exclusively with sound projection. All three volumes are profusely illustrated and contain over 1,400 pages of projection information written so you can understand it clearly. Each volume contains Richardson's famous question and answer index giving immediate access to hundreds of different problems.

These are the books which are being used by projectionists and theatre managers all over the world to secure improved results. Send for this finest of projection libraries today.

### USE COUPON TO ORDER

**CHALMERS PUB. CO.** (M)  
516 Fifth Avenue, New York, N. Y.

Enclosed find (check) (money order) for \$10.25. Send Richardson's 3 volume Handbook of Projection to .....

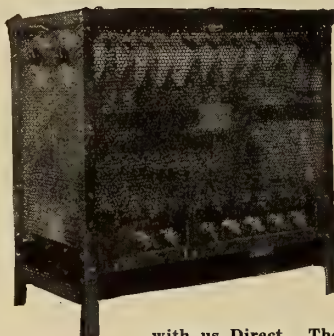
### WINNIPEG, CANADA

**J. M. RICE & CO., J. M. Rice, Prop.** Leading equipment dealers in all kinds of projection room equipment facilities. Representatives of leading equipment manufacturers of the United States and Canada. All our merchandise guaranteed for performance and stability. Whatever you want we will supply it.



# Hoffmann-Soons

## PERFECTION



### ONE OF THE PIONEERS

The motion picture industry is a strong chain composed of many links. Each link represents a branch and is the result of years' experimental and research work put forth by pioneers in this great industry. HOFFMANN-SOONS is one of the links that forms this chain and has played an important part in the building up of this enormous institution.

### THE ONLY UNION MADE RHEOSTAT

Recognized as the Highest Standard everywhere. Now equipped with solderless, adjustable lugs to take wire sizes from No. 4 to 4/0 without any additional cost.

We build rheostats for special requirements. Communicate

with us Direct. There is no obligation. Sold by all Branches of NATIONAL THEATRE SUPPLY CO., SAM KAPLAN, NEW YORK, CONTINENTAL THEATRE ACCESSORIES, and by your dealer.

### HOFFMANN-SOONS

Electrical and Engineering Corporation  
387 First Avenue New York  
Contracting Electrical Engineers—Moving Picture  
Theatre Electrical Specialists

# RHEOSTATS

other device possessing high induction.

**INDUCTION.** Phenomenon of changes of electric current in a circuit due to changes in the magnetic flux cutting the circuit. See **INDUCTANCE**.

**INDUCTION COIL.** A type of **TRANSFORMER, STEP-UP**.

**INDUCTOR.** (1) Any electrical apparatus, or part of one, which acts inductively (see **INDUCTION**) on another or the same circuit. (2) Step-down transformer.

**INERTIA.** (1) Measure of sensitivity (see **SENSITIVITY**) of a photographic emulsion. The value of exposure at which the straight part of the characteristic curve would, if prolonged, cut the axis of exposure. (2) Measure of opposition to mechanical movement of a mass.

**INFRA-RED** rays are invisible rays beyond the red end of the spectrum. Their photographic action is negligibly small. All hot bodies give off large quantities of infra-red rays, which in turn produce heat when absorbed by other bodies.

**INKIES.** Incandescent lamps.

**INTENSITY.** (1) Energy crossing a given area in a given time, divided by the product of area and time. (2) Sometimes used for electric current (quantity per unit time). (3) For light: intensity of illumination is defined as (1) referred to light energy; but for "luminous intensity" of a source, see **LUMINOUS INTENSITY**.

**INTERFERENCE.** Meeting of waves in such a manner as to reinforce or to lessen or cancel one another's effects.

**INVERSION.** All real images, such as are produced by a photographic lens, are inverted upside-down and right to left.

**IONIZATION.** Phenomenon which enables a gas to conduct electricity.

**IRIS** (noun). An adjustable lens diaphragm.

**IRIS** (verb). Same as **IRIS-OUT**.

**IRIS-IN.** To open a diaphragm, somewhere before or behind the photographic lens in a camera, gradually until the full area of the recording frame is exposed. The diaphragm used for this is not the regular lens diaphragm, which has a very rapid movement, but an additional one.

**IRIS-OUT.** To obliterate the image formed in a camera, by reversing the "irising-in" process. See **IRIS-IN**.

**J**

**JACK.** Hole terminating an electrical circuit, into which a plug may be inserted to continue the circuit. Can be seen on almost any telephone switchboard.

**JELLY.** Colored gelatine screen placed before electric lamps to change their color values.

**JENNY.** An electric generator of portable character used on the set.

## By Test Proven Best!



\$9.00  
Each

Imagine! Now on their second year of giving satisfactory service to Hi-Lo lamp users everywhere from Coast to Coast. Surely there must be a reason for this preference for the

### GEM CONTACT JAW

Designed right, made right, and priced right.

Order a Spare Now!

FOGELBERG ENGINEERING CO.

128 S. Clinton St.

Chicago, Ill.

Sold by Reliable Independent Dealers Everywhere

**Subscribe NOW!—At present low rate of  
\$2.00 per Year**



**JOCKEY WALL.** Same as **WILD WALL.**

**JUICE.** Electric current.

**JUICE GANG.** Electricians operating lights.

**JUICER.** An electrician.

## K

**kc.** Abbreviation for **KILO-CYCLE.**

**KEYHOLE.** Camera mat shaped like a keyhole.

**KICK 'EM.** Order to electricians to jar arc lights previous to shooting.

**KILOCYCLE.** Equals one thousand **CYCLES.** Abbreviation, **kc.**

**KILOWATT.** Equals one thousand watts. Abbreviated **kw.**

**KINETIC THEORY.** Theory of the motions of the molecules of which matter is composed.

**KLIEG LIGHT.** Same as **BROAD.**

**NOB TWISTER.** Uncomplimentary slang for **MONITOR MAN.**

**kw.** Abbreviation for **KILOWATT.**

## Sound Reproduction Troubles

(Continued from page 32)

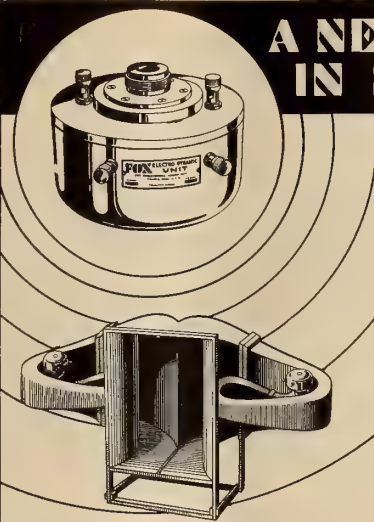
of light from the sound track is received by the photo-electric cell. When photo-electric cells are changed, see that all connections are tight and keep in mind that the photo-electric cell is installed in such a position that it accepts all the vibrations set up in the projector, and if the connections are not tight, they will work loose and considerable noise will be encountered.

When the volume begins to drop off slowly with Movietone reproduction, it is an indication that the photo-electric cell needs replacement or the potential is weak. Always be positively sure that the exciting lamp is operating at the proper value and properly adjusted, before changing the photo-electric cell.

### Cleanliness Imperative

The successful operation of any equipment depends on cleanliness at all times. It is imperative that film emulsion not be allowed to accumulate on the Movietone sprocket and sound gate film path. Inspect the equipment and observe at all times whether it is in good condition. Do not neglect the replacement of worn parts. Always observe meter reading closely and be positively sure that the equipment is operating at the indicated value.

As spare parts are used from time to time, be sure that others are ordered to take their places, so that the spare part supply is fully complete at all times. If a fuse blows out, throw it away. When replacing blown fuses, be positively sure that the new




## A NEW DEPENDABILITY IN SOUND EQUIPMENT

Fox units not only command attention for their output volume and tone value—they offer definite exclusive coil and diaphragm features that insure continuous service.

The Fox Electro-Dynamic Unit and the Fox Rams Horn is a combination that outdemonstrates anything on the market.

*Improve your present equipment with a Fox Unit.*

Complete sound engineering service. Estimates free for special work.



## ENGINEERING COMPANY

386-392 Dorr St., Toledo, Ohio, U.S.A.

## BRIGHTEN UP THOSE DARK CORNERS WITH



## BEST BABY SPOTLIGHTS

An ideal means of illuminating those lobby display boards or any place that individual lighting is required. Well built and well ventilated. It's better to get the BEST.

Price \$15.00 at your dealer

**BEST DEVICES CO.**  
200 Film Bldg., Cleveland, Ohio

**KEEP all your COPIES of  
MOTION PICTURE PROJECTIONIST  
AS A REFERENCE FOR CURRENT  
AND FUTURE NEEDS—PRE-  
SERVE THEM IN A  
BINDER**

\$2<sup>25</sup>  
each

**GOOD SOLID  
IMITATION LEATHER  
—GET ONE**

**ORDER FROM THE MOTION  
PICTURE PROJECTIONIST**

fuse is the proper size. Unwarranted interruptions are caused by using fuses under the load capacity. If oversized fuses are used, it may re-

sult in permanent damage to the equipment.

**New Equipment Instructions**  
When new equipment is received,





## SUPER-LITE LENSES

WISELY CHOSEN BY  
AMERICA'S BEST THEATRES

### New Bifocal Super-Lite Lens

An adjustable focus lens with a wide range of foci for both silent and sound film.

### Series III. Super-Lite Lens

Standard full Half-Size lens furnished in short focus as low as 4" E. F. and up to 10" E. F.

### Series IV. Super-Lite Lens

Full 3" diameter lens to meet the demand for more light for longer throws. 6" E. F. to 10" E. F.

*Quality Guaranteed*

**PROJECTION OPTICS CO., INC.**

330 Lyell Avenue

ROCHESTER, N. Y.

U. S. A.

it is accompanied with operating instructions. These instructions should always be adhered to. Never thread the projector and sound reproducing mechanism carelessly as this may result in film damage and an interruption. It is important that all projectionists establish an inspection and operating routine and follow this routine daily, so as to insure good sound and projection without interruptions.—R. H. McCullough.

### Where Precision is King

IT is doubtful if a machine can be found of which more is required than a talking machine reproducer. It must be rugged in construction to withstand the every-day grind and hard usage, yet it must be so delicately constructed that it can handle electrical currents so small that only the more sensitive of meters will measure them.

Think what it can do! It can transform almost microscopic lines on a strip of film into the most delicate shadings of the human voice. It can change minute scratches on a disc into the same colorful sounds of the human voice and of musical instruments. And it does this in exact synchronism with pictures thrown on the screen.

Think for a moment of the action of the film as it passes through the projector. At one point this film is stopped to a dead standstill 24 times a second as it passes the light aperture, and approximately 14 and one-half inches below this point, the film must pass the sound light aperture smoothly, without even the slightest pause or jerk!

And the sound projector must do these mechanical acrobatics from the first time it is run after being installed in the theatre. We look upon the automobile as a fine piece of mechanism, yet we run the new automobile at reduced speed for the first thousand miles or so to break it in. There can be no breaking in of the sound system after it is installed. In fact, its first performance is often judged more critically than any other.

### Importance of Inspection

How can a machine be made to run so smoothly, to operate reliably day in and day out and to produce music that will meet the test of critical ears? The answer is that the equipment must be manufactured with all the skill required of the watchmaker; it must be made of the finest materials, and every part must pass rigid inspections so that the least flaw or defect may be caught and the erring part eliminated or corrected. At the Hawthorne Works of Western Electric, where the Western Electric sound systems are manufactured, inspection forms a large and important part of the work.

Precision manufacture and inspection

## SOUND REELS

For Perfect Projection

**ALL-WELDED TYPE**  
One Unit

**LASTING DURABILITY**

Bright Cadmium Plated

**UNIVERSAL ELECTRIC**  
9-16 Thirty-seventh Ave.,



—All Sizes—  
**DEMOUNTABLE TYPE**  
Each side, one unit

**ALL PARTS  
REPLACEABLE**

Write for quotations

**WELDING COMPANY**  
Long Island City, N. Y.

Give This to Your Friend—Have Him Fill It in and Mail to us at Once

The Motion Picture Projectionist  
45 West 45th Street, New York City

Gentlemen:

Enclosed please find \$2.00 for which enter my subscription for one year (12 issues) starting with.....issue. (Two years, \$3.00.)

Name .....

Street ..... State .....

City ..... Local No. ....



tion itself has had to be developed to a science to meet this need. Take the sprocket wheels which pull the film through the sound pickup unit, for instance. These wheels must be extremely accurate if the reproduced sounds are not to be distorted. Microscopic measurements are made of the parallelism of the sprocket faces, spacing of the sprocket teeth, and of the eccentricity of the assembled sprocket wheel. The eccentricity must be less than three-tenths of one thousandths of one inch, in order to prevent a flutter in sustained notes when reproducing sounds. A number of delicate inspection processes and machines have been developed and are used to insure such accuracy.

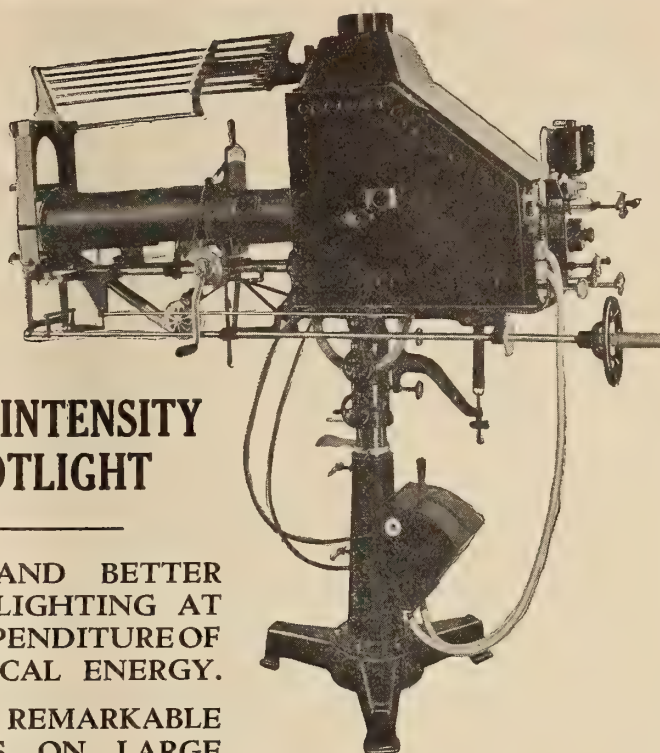
The same precision is carried out in the largest pieces of the equipment. The big frame castings of the universal base, in spite of their size, are machined to dimensions limited in thousandths of an inch, and each casting has every important dimension checked to insure its accuracy before it becomes part of the complete equipment. If the dimensions are a little bit off, the apparatus would still work in all probability, but its function would not be perfect, and the nearest possible approach to perfection must be the aim in producing sound picture equipment.

#### Lens Adjustments

In the film reproduction, a tiny beam of light almost unbelievably accurate in dimensions is required for scanning the sound track. A microscopic fixture operated by a skilled craftsman is employed in adjusting the lens system to produce this light beam .0008 of an inch to .001 of an inch wide (not one third as wide as a human hair), and with .0002 of an inch of being perpendicular to the mounting of the lens holder.

In disc reproduction, the same accuracy and precision manufacture of parts which make up the disc equipment is needed. In manufacturing the bevel gears, methods and machines are used which are far more accurate and precise than those used in producing ordinary gears. Gears for use in automotive equipment and the like are usually finished complete from the blanks, in one cutting operation. Sound picture gears, however, are first rough-cut from the blanks by the use of special cutters and by taking two cuts. They are then finished on machines which are designed on the basis of fundamental, scientifically correct principles to produce perfect gears, but which turn out finished parts at a much slower rate than ordinary machines.

If anything but the finest gears were used, they would produce mechanical vibrations which would be transmitted to the disc pickup, which causes flutter in the reproduced music. Even with the finest gears made, it is necessary to introduce a me-



## HIGH INTENSITY SPOTLIGHT

MORE AND BETTER  
STAGE LIGHTING AT  
LESSEXPENDITURE OF  
ELECTRICAL ENERGY.

MOST REMARKABLE  
RESULTS ON LARGE  
STAGE SETS.

**HALL & CONNOLLY, INC.**  
24 Van Dam St. New York, N. Y.



## Your Preference, Please!

**T**HE editors of MOTION PICTURE PROJECTIONIST solicit your aid to the end that this publication may be of the maximum service to you. Every subscriber can do his bit to improve this service by using the space provided below to indicate his preference for special articles and other material in which he may be particularly interested.

Let us know your preference, please. All requests will receive attention in the order of their receipt, so act quickly. Use the blank below to tell us in just what subject you are particularly interested. Do it now!

Editor,

M. P. PROJECTIONIST:

I am interested in the following subjects, on which I should like to see information in MOTION PICTURE PROJECTIONIST:

1. ....
2. ....
3. ....
4. ....

NAME .....

ADDRESS .....



chanical filter into the turntable drive to eliminate this undesirable flutter.

#### Final Overall Check-up

Before the reproducers are shipped, they are tested with delicate electrical apparatus to insure constant and uniform motion and speed of the turntable. Turntables which do not come up to the requirements are either eliminated or returned to the factory for correction. Any noise created by the operation of the turntable would impair the quality of the reproduction, so a sensitive electrical ear is rested on the disc. It detects any and all noises, and their magnitude is recorded by a noise meter, such as scientists use to measure street sounds. If the apparatus is too noisy when compared to a standard, it is rejected and the condition is rectified.

All gear mesh drives are assembled on benches and operated under load for many hours. These drives are run-in for from one and a half to 24 hours to remove any burrs or slight irregularities from the gears and to insure meeting the noise, backlash and bearing clearance requirements. For free running gears with a minimum backlash, a maximum bearing clearance of .002 of an inch is all that is allowable, and to obtain this fit, machine work comparable to the watchmaker's craftsmanship is called into play.

These are just a few of the tests, inspections and examples of precision work carried out in the manufacture of sound equipment. The same degree of highly skilled work and inspection is, of course, carried out in the production of amplifiers, receivers, tubes, pickup, etc.

## Requirements for Stereoscopic Pictures

By HUGO LATELTIN

THE viewing of motion pictures, although seen with both eyes, can be compared with monocular vision. Any displacement of the eyes has no effect on depth, as the picture being viewed remains always the same and represents only *one particular aspect of an object at one instant*. If we reverse this process and view a motion picture taken with a camera moving on a stream, train, motor van, etc., we receive a perceptible improvement in the illusion of depth due to the ever-changing aspects and views of the object being observed.

When looking into a mirror with only one eye we see a reflected picture. As this picture is not stationary but changes with the slightest displacement of the eye, we receive an impression of depth which is equal to looking at the real object.

There are cases where monocular vision gives a better impression of depth than does binocular vision. When looking at a painting or photograph with one eye from the original point of sight either with the plain eye or through an open tube or peephole, we notice a considerable increase in depth. This effect can be satisfactorily explained when we stop to consider that the painting or photograph represented only one-eye views of objects. By seeing them with both eyes we are easily reminded that the picture is only a flat representation of a real object.

#### Binocular Vision

Although monocular vision will give a plausible conception of depth, it is far from being complete. When looking at a landscape or a group of buildings for a time with one eye, immediately following which we open the other eye, we notice at once the surprising differences in depth between the two methods of vision.

This will indicate our next consideration, binocular vision, which is vision with both eyes.

Looking at an object with both eyes we receive two dissimilar perspective images in both the right and the left eyes. This dissimilarity is the result of the separation between the two eyes (approximately  $2\frac{1}{4}$  inches), and the distance from the eyes of the object being viewed.

There exists a certain upper limit beyond which stereoscopic vision is no longer perceptible; this limit is about  $\frac{2}{5}$  mile. Because of this limitation far-off objects are seen in a plane, mountains appear close together. The stars, although separated by enormous distances are all seen on one plane. The lowest limit in stereoscopic vision is about 10 inches.

Numerous methods have been employed to approximate binocular vision, although they all agree on one point, namely, that the left and right picture view must be seen by the corresponding eye.

There have been attempts to create depth in motion pictures by constantly shifting the camera, simulating through this process the displacement of the eye in monocular vision,<sup>1</sup> but as a complete depth impression can only be obtained when based on the principles underlying binocular vision, these attempts were necessarily unsatisfactory.

#### Stereoscopic Still Pictures

Still pictures have hardly any direct application to motion pictures. It is only necessary in this article to consider the methods used in stereoscopic still pictures insofar as they are interesting from the standpoint of the production of motion pictures.

The inventions relating to stereo-

<sup>1</sup>U. S. Patents 1,579,974 and 1,351,508.

### Index of Advertisers

Bausch & Lomb Optical Co. ....	5
Best Devices Co. ....	39
Bioscope, The ....	37
Brenkert Lt. Projec. Co. ....	4
Canadian Theatre Supply Co. ...	5
Chalmers Publishing Co. ....	37
Eastman Kodak Co. ....	35
Fish-Schurman Corp. ....	34
Fogelberg Engineering Co. ....	38
Forest Electric Corp. ....	36
Fox Engineering Co. ....	39
General Machine Co. ....	35
G-M Laboratories, Inc. ....	36
Hall & Connolly, Inc. ....	41
Hoffman & Soons, Inc. ....	38
Ilex Optical Co. ....	Front Cover
International Projector Corp.,	Back Cover
Kaplan, Sam, Mfg. & Supp. Co. ...	2
Movie Supply Co. ....	37
National Carbon Co. ....	3
National Theatre Supply Co. ....	43
Projection Optics Co. ....	40
Rice, J. M., & Co. ....	37
Roth Bros. & Co. ....	6
Strong Electric Corp. ....	34
Universal Elec. Welding Co. ....	40
Weber Machine Corp. ....	33
Weston Elec. Inst. Corp. ....	4

scopic still pictures can be classified into two groups: (1) stereoscopic pictures which require an analyzing medium in front of the eyes, and (2) those which give stereoscopic relief without the aid of an analyzer. This latter class is naturally of much greater interest in connection with motion pictures than the former.

It is possible to experience the sensation of depth in viewing a left and right eye picture without the aid of a special instrument. In looking at two dots spaced about  $2\frac{1}{2}$  inches apart and focusing our eyes on infinity, we will notice that the two separate dots are gradually moving together, until they finally merge completely. This procedure can be tried, after some experience with the previous experiment, and actual stereoscopic pictures and depth will be realized.

This mode of viewing is obviously rather difficult, and instruments have been available for the past hundred years to facilitate the viewing of stereoscopic pictures.





# How To Judge New Equipment

No projection equipment or group of accessories can accurately be called "staple" or "standard"—change is too rapid. Almost every month new equipment revisions are announced and new accessories appear on the market. Such constant development and improvement are fundamental to any industry; but not all changes are improvements. There are four logical standards of judgment for each new unit of projection equipment and for every new projection accessory: (1) In actual test it must bring greater convenience to the work of the projectionist or show some definite improvement in projection results. (2) Quality of materials and workmanship must assure its reliability over a reasonable period of time. (3) If it is designed simply to replace former equipment, it must fill the job better and at a lower cost. (4) It must be fairly priced. . . . Only when these standards are met is any new item of projection equipment admitted to the National Line. This rigid policy is an unequalled purchasing protection for both Exhibitor and Projectionist. It reduces the need for investigations of new equipment to one simple formulae—"If its value is genuine, it can be procured at any National Branch."

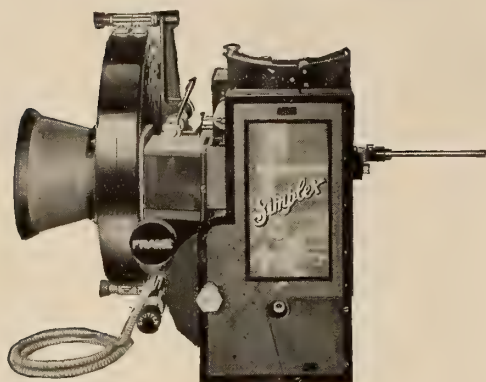


**NATIONAL THEATRE  
SUPPLY COMPANY**  
*Branches in all Principal Cities*



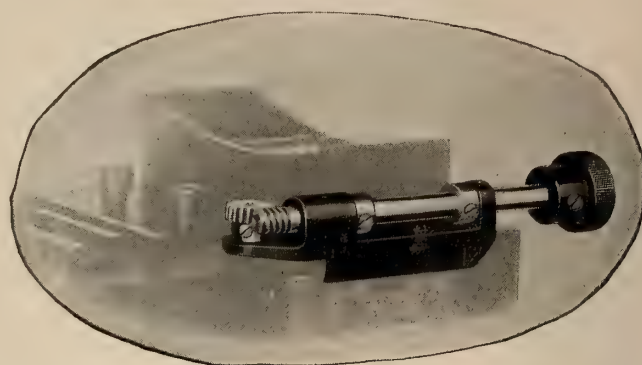
*Simplex*

Rear Shutter Attachment



*Simplex*

Lens Focusing Assembly



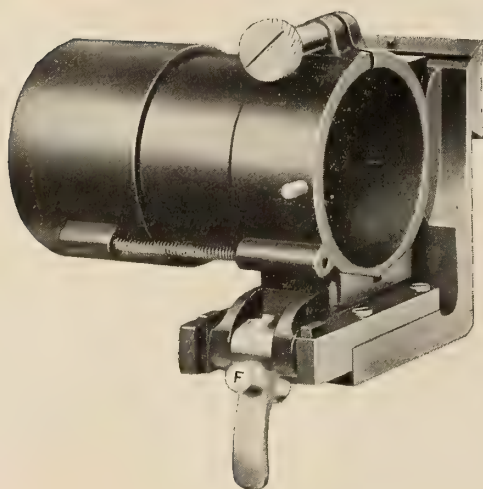
# SIMPLEX ACCESSORIES FOR SIMPLEX PROJECTORS

GIVE MOST SATISFACTORY RESULTS

Send for Booklets Giving Full Particulars

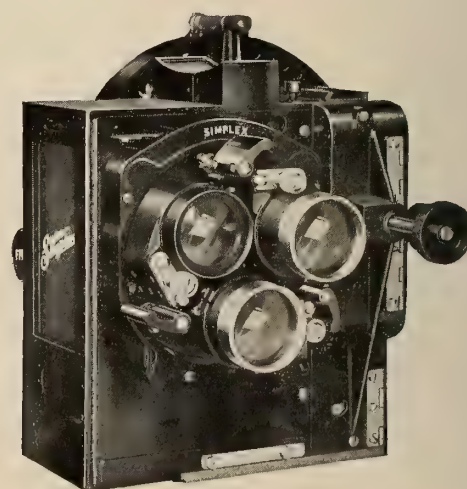
*Simplex*

Lens Aligning Device



*Simplex*

Triple Lens Turret



## INTERNATIONAL PROJECTOR CORPORATION

90 GOLD STREET

NEW YORK

*Simplex*

*The International Projector*



# MOTION PICTURE PROJECTIONIST

*(Fourth Year of Publication)*

## THE ILEX F:2.5

STANDARD ADJUSTABLE  
PROJECTION LENS

### SHORT FOCAL LENGTHS

A new era in screen presentation brings forth larger pictures and wider screens. "Grandeur" effects from 35mm. film are now possible for every theatre with ILEX, offering the finest short focal length lenses that the present day market affords. This is true because ILEX lenses are corrected for critical definition, maximum sharpness, brilliant illumination and flatness of field. Slop-over and incomplete covering of the screen are cared for by the exclusive ILEX adjustable feature.

For the projection equipment you use, ILEX lenses are the best . . . perfect in performance . . . faithful in service. We can furnish engineering data and interesting literature to cover your projection problems.

ILEX OPTICAL CO. ROCHESTER, N. Y.



FURNISHED IN A WIDE RANGE  
OF FOCAL LENGTHS  
2½" to 9"



OPTICAL PRODUCTS OF PRECISION

# ILEX OPTICAL CO.

INSIST UPON ILEX — THE LENS THAT PUTS PERFECTION IN PROJECTION

A Mancall  
Publication

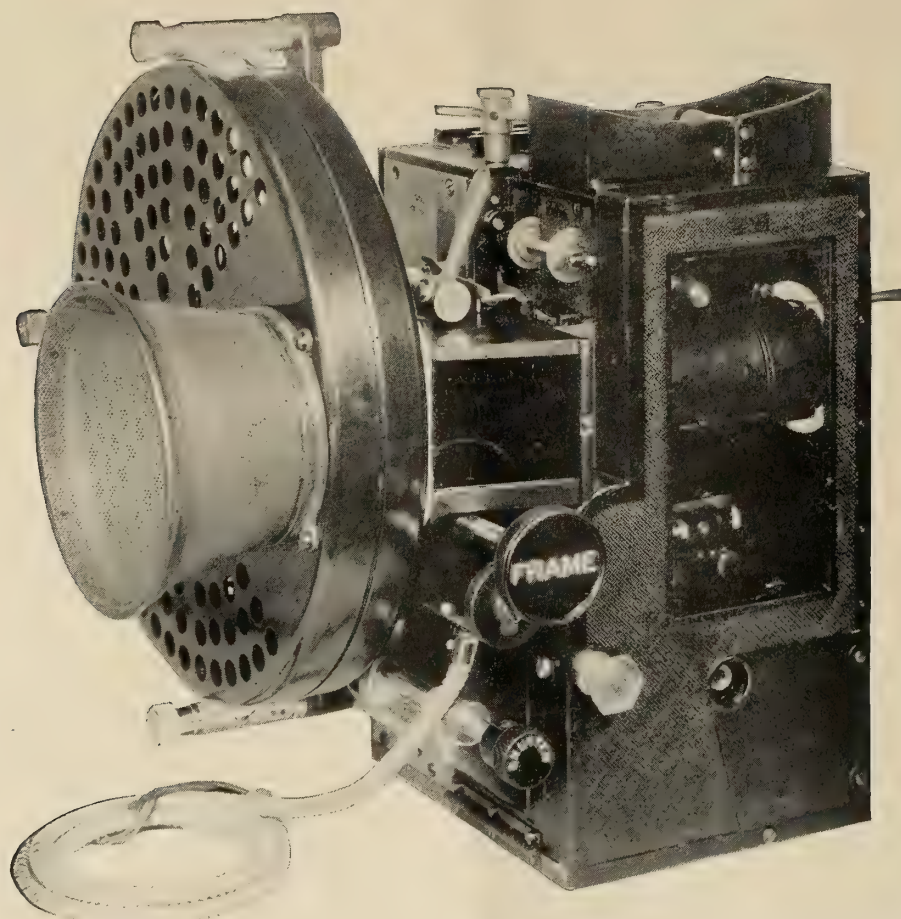
JUNE, 1931

Vol. 4, No. 8  
25c. per copy  
\$2.00 per year



# Now Ready!

# KAPLAN REAR SHUTTER



## Can be Attached to Any Sure-Fit or Simplex Mechanism

*See your local dealer or write to us*

**Sam Kaplan Manufacturing and Supply Company, Inc.**  
729 Seventh Avenue :: New York City



## THEY KEEP A-RUNNING



20/40 to 100/200 Ampere 2-Bearing Actodecor

## Continuous Operation

Based on a complete knowledge of the particular requirements in projection booths, Roth Multiple Arc Type Actodecors are accurately built and liberally proportioned to insure continuous operation... They are especially suited to sound equipment installations... They supply steady direct current power to the arcs, which results in brilliant screen illumination of uniform intensity—even during change-over... Size range—20 to 600 amperes... Furnished in 2- and 4-bearing types, dynamically balanced.

### CENTURY-ROTH INVERTED ROTARY CONVERTERS

*deliver alternating current, from any direct current source, for operating Gaseous Tube Signs, Public Address Systems, etc.*

## ROTH BROTHERS AND COMPANY

*Division of Century Electric Company*

1400 W. Adams St.

Chicago, Ill.

*Distributors and Offices in all Principal Cities*

ACDC-6

DIRECT CURRENT  
MOTORS AND  
GENERATORS



MOTOR GENERA-  
TOR SETS AND RO-  
TARY CONVERTORS



# Fundamentals of Projection

**S**MALL AREA of light source is essential to the projection of a clear, sharp image on the screen. The crater of the carbon arc, just a few millimeters in diameter, is the ideal source of light.

**HIGH INTRINSIC BRILLIANCY** is required of this minute area of light—sixteen million times the high intensity of screen illumination demanded by the critical patron. National Projector Carbons afford an intrinsic crater brilliancy rivaling that of the sun at zenith.

**STEADY LIGHT** is equally essential to satisfying projection. Extensive research and years of experience have enabled National Projector Carbons to supply the steady, white light that is a source of satisfaction to both projectionist and patron.

1

*Two satisfied patrons pay for the  
National Projector Carbons  
used at each performance.*



*. . . Sold exclusively through distributors and dealers.  
National Carbon Company will gladly cooperate with the  
producer, exhibitor, machine manufacturer or projectionist  
on any problem involving light.*

**NATIONAL CARBON COMPANY, INC.**

Carbon Sales Division      Cleveland, Ohio

Unit of Union Carbide  and Carbon Corporation

Branch Sales Offices:    New York    Pittsburgh    Chicago    San Francisco



# MOTION PICTURE PROJECTIONIST

June, 1931

Vol. 4, No. 8

JAMES J. FINN, Editor

Lester Isaac, *Efficiency*; J. H. Kurlander, *Light*; Thad Barrows, *Conservation*; J. E. Robin, *Equipment*; Samuel Wein, *Research*; R. H. McCullough, *Sound Projection*; Harry Rubin, *Improvement*; Victor Welman, *Personnel*; Sidney Burton, *Production*

Published monthly by Mancall Publishing Corp., 7 West 44th St., New York City. Subscription rates in U. S. and Canada: twenty-five cents per copy; two dollars per year; three dollars for two years. Add one dollar for foreign postage. Changes of address should be submitted three weeks in advance of publication date to insure receipt of current issue. Entered as second class matter Oct. 25, 1927, at Post Office, New York, N. Y., under the act of March 3, 1879. Additional entry at New Brunswick, New Jersey.

## Canadian Representative

H. N. Elliott, 203 Vaughan Road  
Toronto, Canada.

## Australian Representative

McGill's Agency  
179 and 218 Elizabeth St.  
Melbourne, Australia.

Editorial & Advertising Office  
7 West 44th St.  
New York City.



## Deny Ries Case Re-Hearing

Western Electric, which successfully defended its position of non-infringement of the Ries patent held by General Talking Pictures, solidified its position recently when the U. S. Circuit Court of Appeals for the Third Circuit denied General Talking Pictures a re-hearing of the case.

For all practical purposes this marks the end of patent litigation, in which General Talking Pictures was the plaintiff, that has extended more than a year. General Talking Pictures brought suit for patent infringement against the Stanley Company for use of Western Electric equipment in the U. S. District Court at Wilmington on four patents. In the case of three the court decided in favor of Western Electric, ruling that no infringement existed. In the case of one, the Ries patent, the court ruled there was an infringement; but this ruling was reversed in a decision given last March by the U. S. Third Circuit Court of Appeals. It is with respect to this decision that General Talking Pictures had asked for and has now been denied a re-hearing.

Western Electric's patent infringement suits against General Talking Pictures are now pending in the U. S. District Court, Southern District of New York.



## ASTIGMATISM has been Banished!

The Bausch & Lomb Super Cinephor Projection Lens is the first anastigmat to be offered for motion picture presentation. All of the advantages of this type of lens—correction for astigmatism and curvature of field—have been developed without the least sacrifice of definition in the center of the field.

Coincident with the Super Cinephor lens, B & L perfected a new condenser system which gives greatly increased illumination over a wide screen area. Because it supplies between 50 and 100% more light it has overcome the problem of reduced illumination due to the general use of perforated screens for sound pictures.

Write for catalog E-16, which describes this new lens and condenser system and gives valuable information about projection.

## BAUSCH & LOMB OPTICAL CO.

680 St. Paul Street

Rochester, N. Y.



# BAUSCH & LOMB

Makers of Orthogon Eyeglass Lenses for Better Vision

## F. S. C.

### GENUINE OPTICAL CROWN GLASS PLATES

Enclose all Portholes for Sound Films and Shut Out the Disturbing Noise of the Projection Room.

No Distortion

No Loss of Light

## FISH-SCHURMAN CORPORATION

45 West 45th Street

NEW YORK CITY

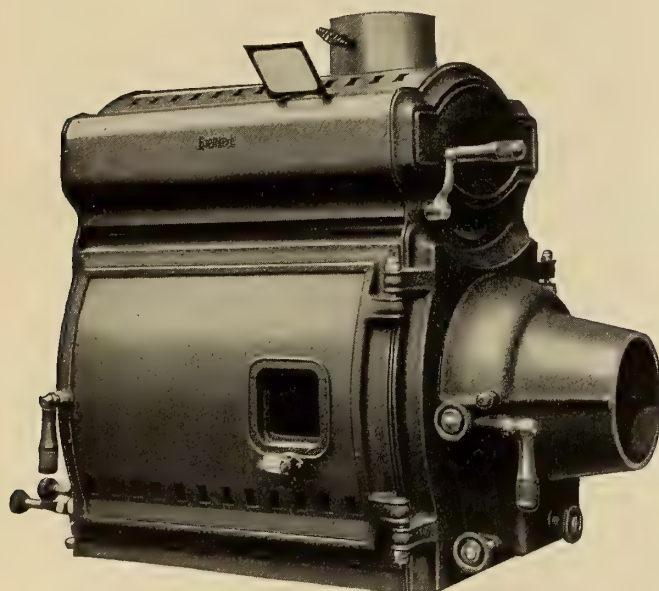


..... If you want  
**PERFORMANCE**  
 you want the new

**Brenkert**

## SUPER HIGH INTENSITY PROJECTION LAMP

This new BRENKERT super lamp consistently produces unequalled screen results with greater efficiency, more accuracy and decidedly lower maintenance costs.



Ask  
 Any  
 User



Write  
 for  
 Literature

CORRECT DESIGN—PRECISION CONSTRUCTION

**BRENKERT LIGHT PROJECTION CO.**

Engineers & Manufacturers

ST. AUBIN AT EAST GRAND BLVD., DETROIT

### S. C. Holds Langmuir Tube Patent Invalid

IN ONE of the most important patent case decisions in many years, the Supreme Court of the United States has held the Langmuir radio tube patent to be invalid. This decision, which definitely settles the question of "How hard is a vacuum?" a point which has been argued at length in many court battles in recent years, reversed a decision of the Third Circuit Court of Appeals which held the Langmuir tube patent to be valid.

The effect of the decision, which was handed down in the case of the De Forest Radio Company against the General Electric Company, which controls the Langmuir patent, was that the Langmuir patent was not infringed by the De Forest concern. The De Forest suit had contended that unless the patent was set aside, General Electric would have a virtual monopoly of the radio tube in common use. The case originated when the District Court of Delaware held the Langmuir patent invalid because of anticipation and want of invention, prior invention and prior use. The Third Circuit Court of Appeals first sustained the District Court and later reversed it. The De Forest company took the case to the Supreme Court on a petition for a writ of certiorari, which the high court granted.

After a review of the scientific aspects of the patent, the Supreme Court opinion stated:

"The narrow question is thus presented whether, with the knowledge disclosed in these publications (an allusion to articles in various scientific journals) invention was involved in the production of the tube, that is to say, whether the production of the tube of the patent, with the aid of the available scientific knowledge that the effect of ionization could be removed by reducing the vacuum in an electric discharge device, involved the inventive faculty or was but the expected skill of the art.

"The question is not, as respondent (G. E.) argues, whether Lilienfeld or others made a practical high vacuum tube but whether they showed how it could be made and demonstrated and disclosed the relationship of the discharge to reduced pressure and how to reduce it. That the production of the high vacuum tube was no more than the application of the skill of the art to the problem in hand is apparent when it is realized that the invention involved only the application of this knowledge to the common forms or low vacuum discharge devices such as the Fleming and DeForest tubes.

"Once known that gas ionization in the tube caused a regularity of current which did not occur in a high vacuum, it did not need the genius of the inventor to recognize and act upon the truth that a better tube for amplifying could be made by taking out the gas.

"Arnold, who was skilled in the art and who had made studies of electrical discharges in high vacuua, when shown a De Forest audion for the first time on Nov. 14, 1912, immediately recognized and said that by increasing the vacuum the discharge would be sufficiently stable and have adequate power levels to enable the tube to be employed as a relay device in transcontinental telephony.

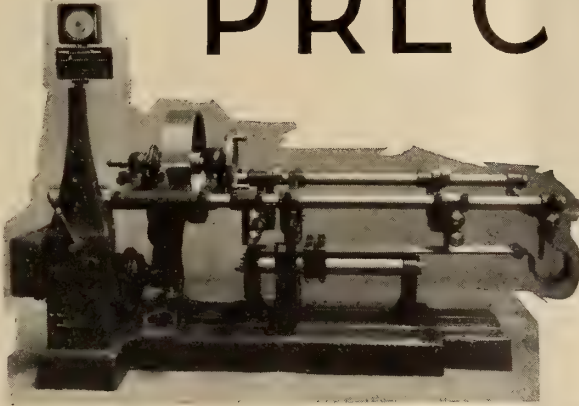
"The very fact that all of significance in the Langmuir improvement was obvious to one skilled in the art as soon as he saw the unimproved tube, as the District Court said, 'lies athwart a finding of invention.'

"Respondent recognizes the force of this objection to patentability, but seeks to avoid it by insisting that the invention claimed is not as we have described it, but that 'Langmuir's invention consisted in taking out of the tube the gaseous conductor upon which the prior art relied, and putting nothing—a vacuum—in its place.'

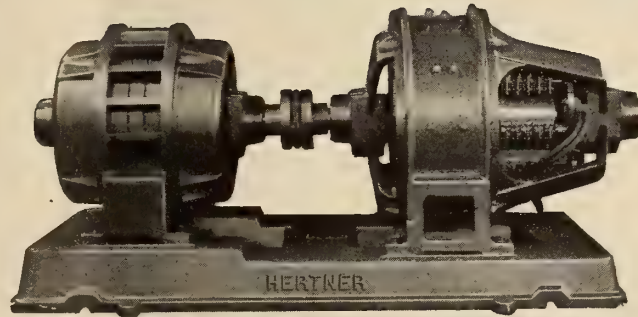
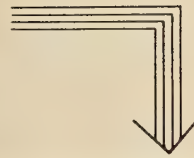
"It adopts also the statement in the opinion of the court below, upon which its decision turned, 'a vacuum, or, indeed, change of vacuum, isolated and standing by itself, is not the Langmuir invention, but it is a working tube in which all the elements, cathode, plate, vacuum, so coordinate and interwork that the current flow is not affected by gas,' a statement which, as we have already pointed out, takes no account of the scientific knowledge, available before Langmuir, that increase of vacuum in well-known devices was all that was necessary to produce the desired result."



# Absolute PRECISION



*The Gisholt Precision  
Balancing Machine  
as used in  
the Hertner Plant*



*Type CP Transverter*

## SIDE LIGHTS on the "TRANSVERTER"

There is a special type and design of Transverter to meet every requirement of the Projection Room.

Armatures in direct connected motor generator sets require absolutely accurate balancing to ensure perfect operation . . . The Gisholt Precision Balancing Machine guarantees this accuracy in all Transverters. . . . Skillful engineering combined with careful workmanship has built into the Transverter a lifetime of satisfactory operation.

# THE HERTNER ELECTRIC COMPANY

12688 ELMWOOD AVENUE

**TransVerteR**

CLEVELAND, OHIO, U. S. A.





## **TECHNICOLOR**

As a result of years of research work, Technicolor is bringing out an improved print which possesses qualities never before achieved in color photography — BRILLIANCE, SMOOTHNESS and FREEDOM FROM GRAIN. Thus, Technicolor presents another notable contribution to the improvement of motion pictures.

### **SUBSTANTIAL PRICE REDUCTION**

The new price of Technicolor release prints, effective May 1, 1931, is seven cents per foot, net, on all orders of twenty or more complete prints from one negative, if such orders are accompanied by cash in the amount of half the estimated cost of such prints.

# **TECHNICOLOR**

**TECHNICOLOR MOTION PICTURE CORPORATION**

**BOSTON**

**HOLLYWOOD**

**NEW YORK**



# A Loudspeaker Good to 12,000 Cycles

By L. G. BOSTWICK

*Member of the Technical Staff, Bell Telephone Laboratories*

**T**WELVE thousand cycles—over five octaves above middle C in the musical scale—of what advantage is a loudspeaker that is capable of so greatly exceeding the pitch limit of any voice or musical instrument. Twelve thousand cycles is within the highest octave that can normally be perceived by the ear, but yet it has been found that certain musical instruments and voices, and many common sounds such as hand-clapping or the jingling of keys or coins, have overtones or harmonics that make such a loudspeaker necessary for perfect reproduction.

In some cases the change in the character of the sounds resulting from suppression of the high frequencies is not objectionable; but in others it may be such as to cause the reproduced sound to bear but little resemblance to the original. Extension of the frequency range of a reproducing system to include the very high frequencies results in marked improvements in the reproduction of impulsive sounds and in the naturalness, color, and brilliance of the reproduced sounds of speech and music.

Although it is possible for the high frequencies to be suppressed at many points in a reproducing system, the loudspeaker is almost certain to be blamed, and often justly. Loudspeakers are usually inefficient at very high frequencies because the mass of the diaphragm impedes the vibratory motion and thereby diminishes the acoustic output. Existing diaphragm shapes and materials do not permit a sufficiently light structure to avoid this effect.

## Air Chamber a Factor

The loss in acoustic output at high frequencies, however, may be diminished by using a horn. The horn improves the acoustical coupling between the diaphragm and the air and thereby makes possible greater sound radiation with smaller vibrational amplitudes. The effect of the mass of the diaphragm in cutting down the acoustic output is consequently minimized because the larger vibrational amplitudes are not required.

The use of a horn, however, in-

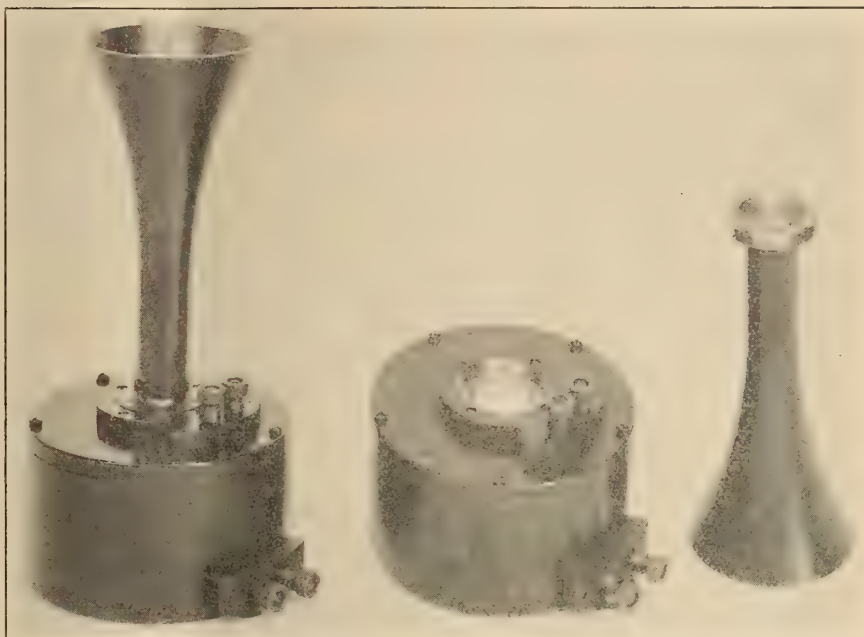


Fig. 1. The new high-frequency loudspeaker efficiently reproduces the higher audible sounds

volves another limiting factor, the air chamber between the diaphragm and the horn throat. The air in this chamber is compressible and as a result tends to diminish the vibratory motion at the horn throat. At low frequencies this compressibility of the air chamber does not usually cause difficulty, but at high frequencies it becomes dominant.

In the loudspeaker shown in Fig. 1 these and other factors that usually cause the high frequencies to be suppressed have been taken into consideration. The diaphragm is made of .002 inch duralumin and is a little over 1 inch in diameter. A spherically embossed section at the center provides rigidity and causes the diaphragm to vibrate as a whole, like a piston. A moving coil of aluminum ribbon wound edgewise is attached to the diaphragm at the periphery of the embossed section and vibrates in a very strong magnetic field in the usual way. The diaphragm and moving coil weigh together but 160 milligrams.

A sufficiently incompressible air

chamber is obtained by making the separation between the diaphragm and horn very small. The chamber stiffness (the reciprocal of the compressibility), is inversely proportional to the separation, and by making this about .010 inch the adverse influence of the chamber is substantially eliminated up to the very high frequencies.

The throat end of the horn conforms to the contour of the diaphragm as can be seen in Fig. 1. Since for equal radiation the amplitude must be larger for low frequencies, this small chamber separation, in limiting the amplitude of the diaphragm, makes it impossible to radiate the low frequencies. Consequently only a small horn, suitable for the high frequencies, is required. The horn shown in Fig. 1 is of the exponential type and is suitable for frequencies above 2,000 cycles. Its mouth is a little over 2 inches in diameter, and its throat is made in the form of an annular slit to minimize high-frequency interference effects within the air chamber.

The curves in Fig. 3 were obtained from measurements of the performance of this loudspeaker at different frequencies. One curve shows measurements of the sound pressure on the horn axis at a distance of about three feet. A calibrated condenser microphone was used as the acoustic meter; the results are expressed in decibels. The other curve shows the absolute efficiency of the speaker, de-

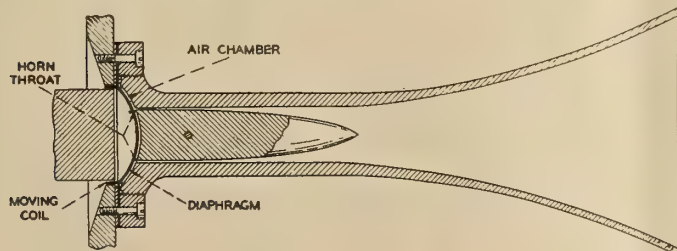


Fig. 2  
The chamber separation in the high-frequency speaker is very small



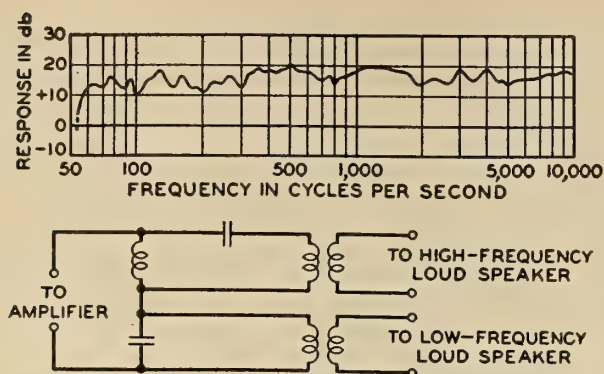


Fig. 3—Above: response-frequency characteristic of the high-frequency loud speaker, measured up to 10,000 cycles on the axis of the horn three feet from its mouth. Below: output characteristic of the high-frequency loud speaker, in decibels relative to the ideal

terminated from measurements of the electrical motional impedance. This efficiency is the mount by which the output of this loudspeaker is less than the maximum possible output obtainable from an ideal speaker.

The average value for the absolute efficiency throughout the frequency range from 3,000 to 12,000 cycles is about twenty per cent.

#### Use Low-Frequency Speaker

Since this loudspeaker cannot radiate at low frequencies, it must be used in conjunction with a loudspeaker designed for the low-frequency range. Either baffle- or horn-type speakers of existing design may be used with it. Figure 4 shows a curve obtained by using the high-frequency loudspeaker with a standard Western Electric theatre speaker having a large 60-cycle cut-off exponential horn. The small speaker was suspended in the mouth of the large horn (Fig. 5), and the two speakers were connected to the electrical supply through a simple electrical network (Fig. 4), which delivered most of the electrical power above 3,000 cycles to the high-frequency

loudspeaker and most of that below 3,000 cycles to the low-frequency speaker.

This arrangement made most effective use of the electrical supply and prevents possible damage to the more delicate high-frequency speaker by large amounts of low-frequency power. The measurements were made in a large felt-lined room with a condenser microphone rotated in an inclined circle 6 feet in diameter about a point on the large horn axis twelve feet from the mouth.

#### Has Several Advantages

The use of such a loudspeaker has several advantages aside from the improved frequency range. It permits a more favorable design of the associated low-frequency loudspeaker because the delicate parts and the restricted dimensions necessary to radiate the high frequencies are not needed. This makes possible greater power capacity and in some cases

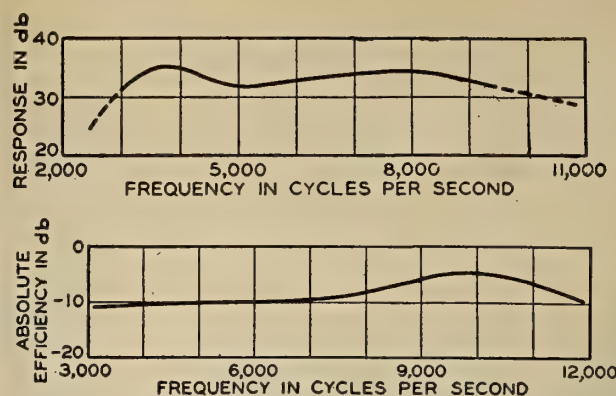


Fig. 4—Connected to the power supply, through the circuit shown, the high-frequency speaker will efficiently reproduce almost all audible sounds

better efficiency in the low-frequency speaker. Another advantage is that it affords more uniform sound-field distribution.

The sound field of loudspeakers of the dimensions necessary for low-frequency radiation often become too concentrated in one direction at the high frequencies. This excessive concentration is due to the large dimensions of the radiating surface compared with the wave-length. By radiating the high frequencies from a small loudspeaker the restriction of the sound field is greatly diminished.

On the other hand, a loudspeaker efficient at high frequencies introduces other difficulties that would not be encountered if the high frequencies were suppressed. For example, amplifier overloading becomes much more strident, and noise may increase to an objectionable extent. A loudspeaker of the type described, therefore, cannot be used to full advantage in systems where these factors are not favorable.

## The Persistence of Vision Phenomenon

By DAVID LEVENSON

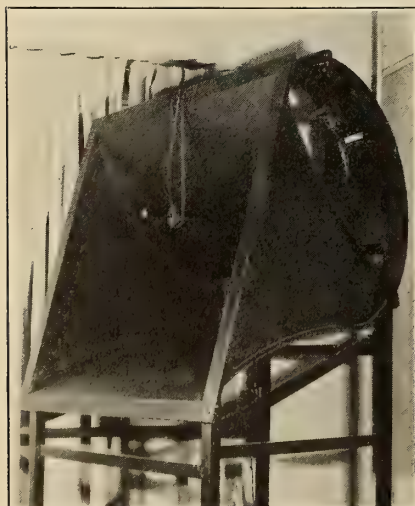


Fig. 5. In obtaining their combined frequency characteristic, the small speaker was suspended in the large horn's mouth

THE psychological and physiological phenomenon, persistence of vision, is the foundation upon which the science of motion pictures is built. Without persistence of vision the human visual, mental and physical apparatus would not be able to perceive to comfortable advantage anything but still pictures, and it was not until the earlier scientists vaguely hit upon this fact, and the later inventors coped with it, that action pictures were developed and put on exhibition.

Experiments with persistence of vision as applied to motion pictures date back to comparatively early times. Twenty centuries ago Ptolemy, the Greek scientist and mathematician, attempted to explain that vision does not seem to stop immediately after an object is removed from sight, but that it persists. To

illustrate his point he employed a spotted disk which he rotated rapidly to show that there was a blending of the spots with fast movement.

At that, however, Ptolemy did not know what had to be done to produce a stimulus that would make the sensitive visual apparatus react consistently. He knew little of the physiology of persistence of vision and what took place within the eye to cause a reaction that made photographed and drawn objects assume life-like form and action when these pictures were brought before the eye in rapid succession.

#### Early Workers in the Art

In later years such men as Sir John Herschel, the discoverer of "hypo," the fixing agent used in photography; Doctor Roget, W. G. Horner, and Joseph Plateau contributed inventions



# **ERPI Service**

**... not just a word but**

# **Insurance**

**against**

# **program interruption**

ERPI's nation-wide staff of engineers gives a new meaning to that much abused and mis-used word — "service". Ordinarily, it means rectifying trouble after something has gone wrong. **ERPI SERVICE**, however, means trouble prevention — a service of insurance. **ERPI SERVICE** actually has proven that it is more than 95% a preventive and less than 5% an emergency organization. **ERPI SERVICE**,

therefore, is an absolute necessity to the theatre owner. Western Electric Sound Systems are designed and made with all the skill and care that goes into Bell System telephone apparatus. But no matter how well designed nor how well made delicate electrical or mechanical equipment may be, constant care is the price of continuously satisfactory performance. **ERPI SERVICE** is your *insurance*—a small price for big returns.



Northern Electric in Canada

Distributed by

**Electrical Research Products Inc.**

250 West 57th Street, New York



which indicated that progress was being made along the right lines and that pictures could be produced through catering to persistence of vision by passing single objects before the eyes in proper sequence.

Sir John Herschel predicted the advent of motion pictures and invented a device of his own which demonstrated persistence of vision; Doctor Roget made the first picture toy showing motion; and W. G. Horner devised the zoetrope, "an open drum, inside of which was a series of pictures: for example, a man in successive poses of a dance. As the drum turned on its axis the eye saw, through a series of vertical slit openings, one picture at a time in such rapid succession that a girl skipping a rope, a boy jumping, horses galloping, or a lumberjack chopping wood appeared in action—a striking effect of persistence of vision."

#### Plateau's Contribution

To Anthony Plateau is due credit for the most significant discovery in connection with persistence of vision and motion pictures as we know them. It was Plateau who first determined that at least sixteen pictures per second have to pass rhythmically before the eye to make the effect appear one of continuous motion. How Plateau drew his conclusion is not clearly set forth, but he certainly must have known a great deal about persistence of vision to arrive at a standard during his time which has been altered but little since the introduction of his theory: for the accepted rate of today is about twenty images per second for silent pictures and about twenty-four images per second for sound pictures.

It is, of course, principally to the proper timing of projection that the success of motion pictures can be traced. The action of persistence of vision must be in perfect order to in turn bring about a suitable reaction on the retina, the sensitive lining of the eye. Therefore, the projected pictures, which serve as stimuli to the retina, must be regulated accurately as to strength and duration or else the desired effect will not be produced.

The reason we are able to conceive pictures as being in action is because the projected images are so timed and indelibly impressed on the retina that before one image dies out, another appears in its place and there is a fusion of one image into the other. The entire process takes place so rapidly that the effect of continuous motion is created, the impression lasting on the retina for from 1/50 to 1/30 of a second.

#### The Cause of Flicker

Inasmuch as acceptable registration upon the retina is so vitally dependent upon the consistently even

regulation of projection, the projectionist can readily realize the harmful effect of flicker and "jerky" pictures upon the perception of vision system. It has been aptly said that "the human eye is a peculiar instrument. It will transmit to the brain, as separate impressions, a certain number of impressions per second. Beyond that number, the impressions become merged into each other, so that the effect is one of continuity. This involves what is termed persistence of vision, which is that peculiarity of the eye which makes possible the illusion of moving pictures. If the flashes of light and darkness come too far apart, or if they be disproportionate to one another, then the eye will perceive them. Under this condition persistence of vision operates incompletely, and instead of the illusion of even, steady illumination, the recurring flashes of light and darkness will be perceived in the form of what we term flicker. Flicker is a very serious matter indeed, in that it causes eyestrain ex-

actly in proportion to its amount. If excessive, the strain on the eyes is severe and very injurious."

True, in some instances faulty film may be blamed for flicker and "jerky" pictures, but in the majority of cases it is likely that poor maintenance of equipment is directly responsible for the introduction of this condition which causes so much eyestrain. The responsibility therefore lies directly upon the projectionist to remedy these conditions by paying strict attention to the upkeep of his machines so that a steady and well-regulated picture will at all times be shown on the screen. Otherwise the mechanics of persistence of vision will not properly be put into play and only unpleasant effects, such as those already mentioned in this article, will be the consequence.

Persistence of vision is a delicate phenomenon that demands exacting attention, and the man in the projection room, more than anyone else, is in the best position to provide that which is so vitally necessary.

## Some Advantages of Super-Sensitive Film

By OLIVER MARSH

*Just what are the advantages of this new film stock? is a question often asked by motion picture workers since the introduction recently of "Super-Sensitive Panchromatic" film. It is known that this new film gives an increase in "speed" of about forty per cent and greatly improves photographic quality, but the "whys" and "hows" of these improvements are not clearly understood. The accompanying article, a contribution to the American Cinematographer by Oliver Marsh, a cameraman who has made two pictures with this new stock, supplies the answer to the questions being asked about this film in a manner that should prove of much interest to projectionists.—*

EDITOR.

EVERYONE who is intimately connected with the technical side of the motion picture industry is agreed that the recent introduction of super-sensitive panchromatic film is perhaps the greatest forward step in cinematographic technique since the introduction of the incandescent light. In this they are quite right: anything that will aid the cinematographer in his effort to put the best possible picture on the screen is of vital importance to the industry as a whole, and the introduction of super-sensitive panchromatic film has afforded him such a powerful means of bettering his work that its value is of fully as great importance as its most ardent advocates could desire.

But after having used this new film to photograph two successive productions—"Cheri Bibi" and "Dancing Partners" for Metro-Goldwyn-Mayer—it seems to me that all of us, technicians and laymen alike, have looked

at this film from the wrong angle. We have stressed its greater sensitivity, or speed, far too much, and almost completely overlooked the fact that its greatest advantage is its immeasurably superior rendition of color.

#### "Speed" Relatively Unimportant

After all, it is of relatively little importance to the studio cinematographer that it is some forty per cent more sensitive to light. Even in this period of hard times, no studio is going to be "saved" by a mere reduction of thirty-five or forty per cent in the quantity of current consumed in lighting its productions. Such a monetary saving is important, of course, but it is valueless if the quality of the picture which ultimately reaches the screens of the world is harmed. Therefore this new film is of merely minor importance if it brings only increased speed, without improvement in photographic quality.

If it brings increased speed plus some improvements in quality, well and good. But if it brings not only a considerable increase in speed, but also a proportional increase in photographic quality, then truly is it a great advancement in cinematographic technique.

And this new film is exactly that. It gives an increase of some forty per cent in speed—which is by no means unimportant—and it gives an even greater improvement in photographic quality—which represents its real claim to importance for studio work. Speed alone is sometimes an advantage in studio production, but improved photographic quality is invariably of vital importance. And



since the new super-sensitive film embodies both of these qualities to a high degree, it is of actual, practical value in our exacting work.

#### Color Work Requirements

It is generally conceded that the best rendition of color is that which most closely approaches the natural visual brilliancy. The old orthochromatic film distorted these relative values very badly, despite anything that we cinematographers could do with filters and careful arrangement of lights. We were satisfied with it because we had to be, since nothing better was available. Then came the first panchromatic film. This was a memorable advance, for it allowed us to achieve a closer approximation of what we actually saw on the set. By the time that we were fairly well accustomed to using "Pan," along came the Mazda light, and an improved panchromatic emulsion, the familiar "Type Two Pan."

By this time, we have learned to use these new tools quite effectively, and our pictures bear witness to the fact that we are now getting quite good color rendition and tonal quality. But even this is noticeably short of perfection. Our blues no longer reach the screen as a muddy white, nor do our reds and greens photograph between a dark gray and black. Intermediate colors reproduce in a respectable range of half-tones. But they do not reach the screen with the same relative brilliancy that we actually see. We are still short of perfection.

With the new super-sensitive panchromatic film, however, our cameras can now see things much as our eyes do. When the art department hands us a set to photograph, we know that we can now pass that set on to our audiences with its tonal values prac-

tically intact, though in monochrome. Our time and ingenuity will no longer be spent in an effort, with lights and filters, to prevent our films from distorting the tonal contrasts achieved by the art directors and costumers.

#### Proper Lighting Important

But to secure these advantages of tonal quality and color separation, we must make sure that they first are in the set, and that the sets are then lighted in a manner that will enhance these tonal contrasts. Many cinematographers who have tried the new film have overlooked the importance of these details, and have accordingly been disappointed with the flatness of their results. Too many of them have confused improved speed with exaggerated contrast.

This is a grave injustice to a truly excellent film. It can not be expected to do something that it is not intended to do. Our aim today is natural tonal contrast with an artistic softness; but this softness can never be achieved by flat lighting. We can—and should—use a soft lighting, yes, but it should be normally balanced, sacrificing none of the tonal and physical contrasts which we wish to preserve, though keeping to a uniform degree of softness throughout. As a rule, we should work with a normally balanced lighting, taking pains to enhance the contrasts which we wish to preserve, and trust to the film not only for better color-separation, but for the desired softness, as well.

Of course, the less that is said about lighting, the better, for no two cinematographers work in quite the same manner. But one thing I must say: just because the new film is in the neighborhood of forty per cent faster, do not be deluded into altering the balance of your lighting. If you can make a forty per cent de-

crease in the total amount of current consumed on your set, well and good; you can save quite a bit of money that way, and the financial gentlemen in your company will hardly like you any less for it. But if you try to make this reduction in lighting at the expense of your natural balance, it will seriously effect the quality of your picture.

#### Less Lighting Units Harmful

Don't be deluded into trying to make this reduction in the number of units you use, for you've got to have a certain number of light-sources to preserve your balanced lighting: use smaller globes in your present equipment, and arrange things just as you always have. In that way you will be able to secure all the advantages of "super-pan" film without running the risk of the inevitable disappointments which attend its unintelligent use. You will find that the tonal quality, color-separation, and general gradation of your picture will be vastly improved, and with this improvement will come a surprising improvement in perspective.

I have seen comparative tests, made with the same camera, lens, and set-up, but with "Type Two" panchromatic and super-sensitive panchromatic films, in which the difference in perspective was so marked as to make experienced cinematographers doubt that the same lens was used in both instances. But, above all things, remember that while cinematography has never been a task for the thoughtless workman, it is vastly less so now that we have so sensitive a tool as this new super-film; and the measure of the results obtained from super pan is exactly the measure of the care and thought put into its application to the problem in hand—getting the best and most natural picture in the most efficient way.

#### S. R. P. Eliminates Cue Sheets

The establishment of the Standard Release Print has made possible the abandonment of cue sheets for the projection of sound pictures, according to announcement of the Technical Bureau of the Academy of Motion Picture Arts and Sciences.

Studios and exchanges have been notified by Lester Cowan, Manager of the Bureau, that the distribution of cue sheets with prints may be safely discontinued. Spaces left for the purpose in the Standard Release Print will be used by the studios for any special information or statement of fader settings which the Projectionist should have to run the show. Approval of this change in practice has been given by the Producers-Technicians Committee of the Academy.

The abandonment of cue sheets will mean a saving of several thousand dollars a year to each of the companies which have been sending them out with prints since the introduction of sound.

## This "Super Sensible" Film Muddle

On every job there's a laugh or two, and the introduction recently of "Super-Sensitive" film stock resulted in the following communication addressed to Howard Hurd, Business Representative of Local Union 659 (Cameramen), as reported in a recent issue of *International Photographer*:  
*Hon. Howard Hurd & Brother, Business Representative, Location 659.*

Dear Mr. & Sir: As I am a Japanese assistant cameraman and a green ticket member of Location 659, I bow in my middle to you in greeting.

I have much reading on the subject of Super Sensible film being made by Hon. DuPont and Hon. Eastman. After absorbing into my knowledge many gammas, balances, longitudes and SPEED, I am writing in letter to you this question for a puzzle.

Directions for loading this super film are as follows:

#### 1. "Load in complete darkness."

Now, Hon. Mr. Hurd, I desire to impart to my memory how dark is "complete." Because this new film is so very sensible to the least light I have entertainments of fear and misgiving about opening tin cans in ordinary dark room. Is it necessary to render the darkness in my dark room a very dark black darkness before opening cans? If so, how can it be?

Hon. Sir, I would depreciate a careful answer as I realize loading must be done in sufficient darkness that a double exposure of my face does not appear on this very rapid film along with artistic interruptions placed thereon by my Hon. 1st cameraman. Otherwise my face will be double-exposed upon the out-of-working list also.

Hoping you are same,

Fraternally yours,

IKARI KARDI.



# S. M. P. E. Spring Meeting in Hollywood

**N**EVER before in its history has there been such an extensive and inclusive a meeting as the planned for the Spring Meeting of the Society of Motion Picture Engineers to be held in Hollywood at the Roosevelt Hotel, May 25-29. Sixty-eight papers and ten committee reports are scheduled for presentation during the five days of the meeting. Five sessions will be devoted to symposiums on Color Photography, Studio Practices, Sound Recording, Laboratory Practices and Theatre Practices. These symposiums will be held Monday afternoon, Tuesday morning, Wednesday morning, all day Thursday, and Friday morning, respectively.

Among the papers of especial interest and value are three on "Sensitometry" to be presented by L. A. Jones of the Eastman Kodak Company. D. K. Gannett of the American Telephone and Telegraph Company will present a paper entitled "Detail in Television." "Pioneer Experiments in Sound Recording" by Eugene Lauste will be an interesting contribution from an historical standpoint.

"The Latin American Audience Viewpoint to American Films" by N. D. Golden, Motion Picture Bureau of Foreign and Domestic Commerce, should prove of value to producing organizations as have Mr. Golden's papers in the past. A group of films called the "Baron Shiba Films" will be exhibited. These pictures were made in Japan and loaned to the Society through the courtesy of the Bureau of Standards. The pictures are made at an extremely high rate of speed and are projected so as to show in slow motion certain very high speed phenomena.

## Noiseless Recording Developments

At least four papers will be read on new developments of noiseless recording. Two papers will describe two new types of microphones. During the symposium on Studio Practices talks by prominent actors, directors, musical directors and writers are scheduled. C. H. Dunning will give a paper entitled "The Dunning Process and Process Backgrounds." S. K. Wolf's paper, "Noise Measurement," will present the latest problems and methods on noise measurement, control and abatement. "Making Motion Pictures in Asiatic Jungles" by G. S. Mitchell of Universal, will be an interesting highlight of motion picture adventure.

Five papers have already been scheduled for the special color session at which Dr. C. E. K. Mees, Director of Research of the Eastman Kodak Company, will preside. These papers

and their authors are "Technicolor" by J. A. Ball; "Hand Coloring of Motion Picture Film" by Gustave Brock; "Design and Construction of Multi-Color Equipment" by Bruce Burns; "M-G-M Color Process" by O. O. Ceccarini; and "Multi-Color Process" by R. M. Otis.

Representatives from at least five countries will attend the meeting. From Germany there comes a delega-

tion of five, headed by Oskar Meester, leading German motion picture engineer. Two engineers will be present from England. Ronald Jay of Scotland, and Luigi Ranieri from Italy will also be present.

## Big Equipment Exhibit

Twelve motion picture equipment concerns have already arranged for space to exhibit new motion picture

## S. M. P. E. Meeting Papers Program

### Monday, May 25th

8:30 to 9:30 A. M.—Convention Registration.

9:30 A. M.—Convention Called to Order (American Legion Auditorium).

Address of Welcome.

Response by the President.

Report of the Convention Committee—W. C. Kunzmann, Chairman.

Reports of Secretary and Treasurer.

Report of the Progress Committee—C. L. Gregory, Chairman.

"Detail in Television," by D. K. Gannett, American Telephone & Telegraph Company, New York, N. Y.

"Pioneer Experiments in Sound Recording," by Eugene Lauste.

"Baron Shiba Films."

(These films were made in Japan and loaned to the Society through the courtesy of the Bureau of Standards. The pictures are made at a very high rate of speed and are projected so as to show in slow motion certain very high speed phenomena.)

"The Latin American Audience Viewpoint to American Films," by C. J. North and N. D. Golden, Motion Picture Division, Bureau of Foreign and Domestic Commerce, Washington, D. C.

12:30 to 2:00 P. M.—Luncheon.

2:00 P. M.—Symposium on Color Photography (American Legion Auditorium).

(This section will be principally devoted to papers leading to a thorough discussion of the status and progress of color photography. Dr. C. E. K. Mees of the Research Laboratory of the Eastman Kodak Company will preside.)

Introductory Remarks by Dr. C. E. K. Mees. "Technicolor," by J. A. Ball, Technicolor Motion Picture Corporation, Hollywood, Cal.

"Multicolor Process," by R. M. Otis, Hughes Development Co., Ltd., Los Angeles, Cal. "Multicolor Photography," by Bruce Burns, Hughes Development Co., Ltd., Los Angeles, Cal.

"Comparison of the Technique of Making Two and Three Color Separation Negatives," by P. D. Brewster, Brewster Color Film Corporation, Newark, N. J.

"M-G-M Color Process," by O. O. Ceccarini, Metro-Goldwyn-Mayer Studios, Culver City, Cal.

"Hand Coloring of Motion Picture Film," by Gustav Brock, New York, N. Y.

Report of Color Committee—W. V. D. Kelley, Chairman.

Report of Papers Committee—O. M. Glunt, Chairman.

Report of Membership and Subscription Committee, H. T. Cowling, Chairman.

8:00 P. M.—Exhibition of recent films of interest (American Legion Auditorium).

### Tuesday, May 26th

8:30 to 9:30 A. M.—Registration.

9:30 A. M.—Symposium on Sound Recording (American Legion Auditorium).

(This section will be principally devoted to papers leading to a thorough discussion of the status and progress of sound recording.)

"Noiseless Recording," by H. C. Silent, Electrical Research Products, Inc., Hollywood, Cal.

"A Shutter for Ground Noise Reduction," by E. W. Kellogg and C. M. Batself, RCA Victor Company, Camden, N. J.

"Noise Reduction with Variable Area Recording," by B. Kreuzer, RCA Photophone,

Inc., New York, N. Y.

"The Ribbon Microphone," by H. F. Olson, RCA Photophone Inc., New York, N. Y.

"A Moving Coil Microphone for High Quality Sound Reproducing," by W. C. Jones and L. W. Giles, Bell Telephone Laboratories, New York, N. Y.

"A Sound Film Reproducer for Re-recording Work," by J. J. Kuhn, Bell Telephone Laboratories, New York, N. Y.

"Recording, Re-recording and Editing of Sound," by Carl Dreher, RKO Studios, Inc., Hollywood, Cal.

"Recording Sound for Split Mat Photography," by L. E. Clark, RKO Pathe Studio, Culver City, Cal.

12:30 to 2:00 P. M.—Luncheon.

2:00 P. M.—A visit to one of the large studios is being arranged for those who wish to take this trip.

8:00 P. M.—Papers (American Legion Auditorium).

"Sensitometry—Part I," by L. A. Jones, Eastman Kodak Company, Rochester, N. Y.

"Characteristics of DuPont Negative Film," by B. R. White, DuPont Pathe Film Mfg. Co., Parlin, New Jersey.

"Characteristics of New Eastman Negative Film," by Emery Huse, Eastman Kodak Co., Hollywood, Cal.

"High Speed Oscillograph," by A. M. Curtis and C. H. Rumpel, Bell Telephone Laboratories, New York, N. Y.

"Improvements in Motion Picture Laboratory Apparatus," by C. E. Ives, A. J. Miller, and J. I. Crabtree, Eastman Kodak Company, Rochester, N. Y.

"Recent Developments in Thermionic Devices," by M. J. Kelly, Bell Telephone Laboratories, New York, N. Y.

Report of Sound Committee—H. B. Santee, Chairman.

Report of Standards and Nomenclature Committee—A. C. Hardy, Chairman.

Report of Publicity Committee—W. Whitmore, Chairman.

### Wednesday, May 27th

9:30 A. M.—Symposium on Studio Practices (American Legion Auditorium).

(This section will be principally devoted to papers leading to a thorough discussion of the status and progress of studio practices.)

"Sensitometry—Part II," by L. A. Jones, Eastman Kodak Company, Rochester, N. Y.

"Miniature Models of Sets," by Hans Dreier, Paramount Publix Corp., Long Island City, N. Y.

"Use of Dialogue in Sound," by Colonel Joy, Motion Picture Producers and Distributors Association.

"The Depth of Field of Camera Lenses," by A. C. Hardy, Mass. Institute of Technology, Cambridge, Mass.

Talks: by prominent studio personnel.

Actor—Director—Musical Director—Writer. (Names to be announced later.)

"Making a Motion Picture," by Paul Snell, Paramount Publix Corp., Hollywood, Cal. Report of Studio Lighting Committee—M. W. Palmer, Chairman.

12:30 to 2:00 P. M.—Luncheon.

2:00 P. M.—A Bus Trip to Beverley Hills, Beaches, etc., is being arranged for those who wish to take it.

8:00 P. M.—Semi-Annual Banquet in the Blossom Room of the Hotel Roosevelt. Dancing.



equipment at the meeting. The companies to exhibit are: R. C. A. Telephone, Mole-Richardson, Moviola, Weston Electric Instrument Corporation, Electrical Research Products Inc., Pacent Reproducer Corporation, Oscar B. DePue, Newmade Products Corporation, National Projector Corporation, Ashcraft Automatic Arc Company, Eastman Kodak Company, and Bell & Howell.

The Historical Committee of the Society will also have an exhibit of motion picture equipment and films of historical interest. It is expected that a number of companies other than those listed will also exhibit at the meeting.

The banquet will be held Wednesday evening in the Blossom Room of the Roosevelt Hotel, at which time a number of prominent men in the in-

dustry will speak. Trips have been arranged for those from the East to visit the studios, Beverly Hills, the beaches and other interesting points.

Appended hereto are abstracts of a number of papers which will be read at the meeting:

#### PROPERTIES OF LOW INTENSITY REFLECTING ARC PROJECTOR CARBONS

*D. B. Joy and A. C. Downes*

The characteristics of the latest type of low intensity reflecting arc carbons (which are capable of burning at higher currents than those previously available), are presented. These include current capacity, candle power, angular light distribution, crater diameter and intrinsic brilliancy.

These characteristics are discussed in relation to the optical system. It

is shown that although the maximum screen light from the present optical system as determined by photometric measurements can be obtained at a comparatively low current, there are decided practical advantages in using a higher current and larger carbons than the minimum theoretically possible.

It is also demonstrated that the faster projection lenses now available, together with a change in the magnification of the reflector system, should make possible an increase of theoretically 75% in screen light over that now available with the present system. This increased screen light will have the same uniformity, flexibility and factor of safety as that now obtained provided the correct carbons and currents are used.

#### A MOVING COIL MICROPHONE FOR HIGH QUALITY SOUND REPRODUCTION

*W. C. Jones and L. W. Giles*

A microphone is described in this paper which retains all of the inherent advantages of the moving coil type of structure but unlike the earlier forms of this microphone responds uniformly to a wider range of frequencies. It is more efficient than the conventional form of condenser microphone and its transmission characteristics are unaffected by the changes in temperature, humidity, and barometric pressure encountered in its use. Unlike the condenser microphone, the moving coil microphone may be set up at a distance from the associated amplifier and efficient operation obtained. Owing to its higher efficiency and lower impedance it is less subject to interference from nearby circuits. It is of rugged construction and when used in exposed positions is less subject to wind noise.

#### NOISE MEASUREMENT

*S. K. Wolfe and G. T. Stanton*

The instrumental measurement of noise presents difficulties that have in the past generally defeated its successful accomplishment. While noise exists in a physical state and certain of its quantities are susceptible to direct measurement, the magnitude of a noise is evaluated through the interpretation of the human ear. The ear is non-linear in its evaluation of the various factors of noise. The degree and nature of the ear's non-linearity to the principal factors is discussed, with respect to the chief interpretive impression, that of loudness.

Audiometric measurements approached a more proper evaluation of noise, but in addition to dependency upon human judgment, were only approximate and represented comparisons of physiological effects of noise rather than true noise values.

An instrument is described that measures intensity, expressed in terms of loudness, evaluated for frequency and duration, and combining portions of a complex wave-shape in

#### Thursday, May 28th

9:30 A. M.—Symposium on Laboratory Practices. (American Legion Auditorium.)

(This section will be principally devoted to papers leading to a thorough discussion of the status and progress of laboratory practices.)

"Universal Developing Machine," by J. A. Dubray, Bell & Howell Co., Chicago, Ill.

"M-G-M Developing Machine," by J. M. Nickolaus, Metro-Goldwyn-Mayer Studios, Culver City, Cal.

"Variable Area Processing," by D. D. Foster, Bell Telephone Laboratories, New York, N. Y.

"The Study of Exposure and Film Processing for Variable Area Recording," by E. W. Kellogg and G. L. Dimmick, RCA Victor Company, Camden, N. J.

"The Processing of Variable Area Sound Records in the Film Laboratory," by W. P. Bielickie, RKO Studios, Inc., Hollywood, Cal.

"Processing for Variable Density Records," by J. G. Frayne, Electrical Research Products, Inc., Los Angeles, Cal.

"Analysis of Negatives," by L. A. Jones and C. M. Tuttle, Eastman Kodak Company, Rochester, N. Y.

"New Sensitometer," by L. A. Jones, Eastman Kodak Company, Rochester, N. Y.

"Two Special Sensitometers," by B. R. White, DuPont Pathe Film Mfg. Co., Parlin, N. J.

12:30 to 2:00 P. M.—Luncheon.

2:00 P. M.—A visit to one of the large studios is being arranged for those who wish to take this trip.

2:00 P. M.—Continuation of Symposium on Laboratory Practices (American Legion Auditorium).

"Sensitometry—Part III," by L. A. Jones, Eastman Kodak Company, Rochester, N. Y.

"Directional Effects in Sound Film Processing," by J. Crabtree, Bell Telephone Laboratories, Inc., New York, N. Y.

"Straight Line and Toe Records with Light Valve," by D. MacKenzie, Electrical Research Products, Inc.

"Reducing and Intensifying Solutions for Motion Picture Film," by J. I. Crabtree and L. E. Muehler, Eastman Kodak Company, Rochester, N. Y.

"Electrolytic Regeneration of Motion Picture Fixing Baths," by K. Hickman, Eastman Kodak Company, Rochester, N. Y.

"Automatic Control of Electrolytic Recovery Apparatus," by K. Hickman, Eastman Kodak Company, Rochester, N. Y.

"The Dunning Process and Process Backgrounds," by C. H. Dunning, Hollywood, Cal.

8:00 P. M.—Exhibition of representative films from various studios representing recent advances in sound picture technique. (American Legion Auditorium.)

#### Friday, May 29th

9:30 A. M.—Symposium on Theatre Practices (American Legion Auditorium).

(This section will be principally devoted to papers leading to a thorough discussion of the status and progress of theatre practices.)

"An Apertureless Optical System for Sound on Film," by R. C. Burt, R. C. Burt Scientific Laboratories, Pasadena, Cal.

"Continuous Non-Intermittent Projectors," by A. J. Holman, East Orange, N. J.

"Properties of Low Intensity Reflecting Arc Projector Carbons," by D. B. Joy and A. C. Downes, National Carbon Co., Cleveland, Ohio.

"An AC Operated Sound Motion Picture Reproducing Equipment," by T. D. Cunningham, RCA Victor Company, Camden, N. J.

"Motion Picture Screens," by F. M. Falge, Beaded Screen Corp., New York, N. Y.

Committee Reports.

Projection Theory Committee—W. B. Rayton, Chairman.

Projection Screens Committee—S. K. Wolf, Chairman.

Projection Practice Committee—H. Rubin, Chairman.

12:30 to 2:00—Luncheon.

2:00 P. M.—Papers (American Legion Auditorium).

"New Printing Machine," by O. B. DePue, DePue & Vance, Chicago, Ill.

"Air Conditioning by Carrier Method," by A. H. Simonds, Carrier Engineering Corp., Newark, N. J.

"Air Conditioning," by E. C. Holden, Silica Gel Corp., Baltimore, Md.

"Noise Measurement," by S. K. Wolf, Electrical Research Products, Inc., New York, N. Y.

"Measurements with a Reverberation Meter," by V. L. Chrisher and W. F. Snyder, Bureau of Standards, Washington, D. C.

"Application of Optical Instruments in the Motion Picture Industry," by I. L. Nixno, Bausch & Lomb Optical Company, Rochester, N. Y.

"The Mercury Arc as a Source of Intermittent Light," by H. E. Edgerton, Massachusetts Institute of Technology, Cambridge, Mass.

"New 35 mm. Portable Sound Equipment," by H. Griffin, International Projector Corp., New York, N. Y.

8:00 P. M.—Papers (American Legion Auditorium).

"New Newsreel Camera," by J. L. Spence, Akeley Camera, Inc., New York, N. Y.

"Making Motion Pictures in Asiatic Jungles," by G. S. Mitchell, Universal Pictures Corp., Universal City, Cal.

"Simple Apparatus for Cine-Photomicrography," by A. C. Hardy and O. W. Pineo, Massachusetts Institute of Technology, Cambridge, Mass.

"A Stroboscopic Darkroom Inspection Lamp," by K. Hickman, Eastman Kodak Company, Rochester, N. Y.

"Protecting the Theatre Against the Fire Peril," by R. B. Dickson, Pyrene Mfg. Co., Newark, N. J.

"Storage and Handling of Film," by E. W. Fowler, National Board of Fire Underwriters, New York, N. Y., and L. B. Newell, New York Fire Insurance Rating Organization, New York, N. Y.

"Reversing the Form and Inclination of the Motion Picture Theatre Floor for Improvement in Vision," by Ben Schlanger, New York, N. Y.



a suitable manner. The characteristics of the meter and the ear are compared. The readings are in decibels above a zero reference point near the threshold of audibility. The selection and meaning of this scale is explained. Where it is desired to analyze the pitch or frequency of a noise an analyzer attachment permits either band or single frequency analysis. Some limitations in its use in noise measurements are discussed.

#### THE RIBBON MICROPHONE

*Harry F. Olson*

The ribbon microphone consists of a light metallic ribbon suspended in a magnetic field and freely accessible to air vibrations from both sides. The vibration of the ribbon due to an impressed sound wave leads to the induction of an e.m.f. corresponding to the inductions of the incident sound wave. The ribbon is driven from its equilibrium position by the difference in pressure existing between the two sides. In general the ribbon is made light so that its motion corresponds to the motion of the air particles to very high frequencies. One of the important advantages of this type of microphone as compared with a pressure operated microphone is that it possesses marked directional properties. This has decided advantages in sound motion picture work.

#### CONTINUOUS NON-INTERMITTENT PROJECTORS

*Arthur J. Holman*

The ideal projector and its product, ideal projection, are defined in terms of the screen image. The particular characteristics which distinguish continuous non-intermittent projection are given. The apparent attitude of the motion picture industry toward improvements in projection and the reasons therefor, are presented. Types of variable refraction projection systems are discussed with a view to pointing out the advantages possessed by the revolving lens-wheel system. The single-lens-wheel system is described briefly. The main purpose of the paper is to dispel the unbelief and skepticism regarding the possibilities of non-intermittent projection and to clear the way for scientific investigation of the continuously illuminated non-periodic screen image.

#### RECORDING, RERECORDING AND EDITING OF SOUND FILM

*Carl Dreher*

This paper is on the borderline between the artistic subject of editing sound film and the technical fields of recording and rerecording. The topics discussed are: characteristics of effective sound recording; functions of rerecording; equipment for rerecording; common faults of rerecording; sound effects—analogy with special process photography; personnel and organization for rerecording and editing; choice of sound tracks in rerecording and editing. The purpose

#### Report Many Small-Theatre Sound Installations

Reports of installations made by the various distributors of sound picture reproducing apparatus for the week ending May 16 would seem to bear out the predictions made earlier this year to the effect that by the end of 1931 all theatres, large and small, in the United States would have been equipped with some type of sound picture equipment.

Latest Western Electric reports show a steady demand for the small-theatre equipment recently introduced by that company, and this demand is expected to hold firm throughout the summer months. W. E. has just topped the 5,000 mark for domestic installations, a Brooklyn theatre having been wired last week to round out this figure.

From RCA Photophone comes reports that the all-A.C. operated equipment now being offered for sale is proving extremely popular with the owners of small theatres. Since March 19th last more than 120 small-theatre equipments have been installed by RCA, with sufficient orders on file to keep the Installation Department busy throughout the summer.

of the paper is to show how rerecording and editing must be closely coordinated to give the desired emotional and artistic effect in the finished picture.

#### MEASUREMENTS WITH A REVERBERATION METER

*V. L. Chrisler and W. F. Snyder*

A description is given of apparatus with which the rate of decay of sound energy in a room may be measured. A loud speaker is used as a source of sound. When the sound has reached a steady state the loud speaker circuit is opened and at the same time a timer is started. When the sound energy has decayed to some definite value the timer is automatically stopped. If made in a portable form this equipment may be used to study the acoustical properties of auditoriums. Attention is called to the errors which may occur in these measurements.

#### AN APERTURELESS OPTICAL SYSTEM FOR SOUND ON FILM

*Dr. Robert C. Burt*

An optical system is described which uses positive and negative cylindrical lenses with their axes at right angles. The image of a source is optically elongated and flattened by these cylindrical lenses to the proportions desired and is then focused on the film.

Advantages are: maximum possible brilliancy with a given source tem-

perature; not sensitive to position of the lamp filament; sharpness of image; and it gives intrinsically perfectly uniform brilliance throughout the length of the beam.

#### REVERSING THE FORM AND INCLINATION OF THE MOTION PICTURE THEATER FLOOR FOR IMPROVEMENT OF VISION

*Ben Schlanger*

This article presents two new forms for a motion picture theater, which is considered as a structure intended purely for motion picture exhibition under the best conditions. These forms affect the present floors. One is arrived at by reversing the slope of the orchestra floor, by raising the position of the screen, and adjusting the seats to the new angle of vision. The other is by changing the horizontal angles of the seats in relation to the screen. The balcony pitch is also lessened, thus economically reducing the height of the structure, and also affording a more comfortable view of the screen. This plan also adapts itself more readily to the use of the enlarged screen than does the present type of theater, and also allows for better projection and acoustics.

#### NOISE REDUCTION WITH VARIABLE AREA RECORDING

*Barton Kreuzer*

Methods of accomplishing noise reduction are described, together with the factors influencing equipment design. An analysis of the circuit operation is provided. "Time Constants" of the apparatus are covered and a complete description as well as photographs of the final commercial equipment now in use in studios, are included.

#### HAND COLORING OF MOTION PICTURE FILM

*Gustav Brock*

The paper deals with the advantages of selective hand-coloring, as distinguished from more or less complete coloring which is not yet perfected, and covers shortly the use of hand-coloring in educational, commercial and theatrical pictures. Finally, a description is given of the equipment used for hand-coloring.

#### RECENT CONTRIBUTIONS TO LIGHT VALVE TECHNIQUE

*O. O. Ceccarini*

This paper describes structural changes made in light valves, with the object of improving their quality, stability of operation and efficiency, the most important being the introduction of damping to offset resonance. These features are chiefly considered from the standpoint of production requirements and engineering economics. The shape of exposure

(Continued on page 34)



# Elements of Magnetism and Electricity

By SIEGFRIED S. MEYERS†

## III

IT is absolutely essential that the projectionist should understand the various symbols as they are commonly employed in diagrams of electrical circuits, so that he may correctly interpret diagrams should an emergency arise. He should understand not only symbols and circuits but also how to use intelligently electrical measuring instruments, a knowledge of the proper use of which is very important in motion picture projection work.

It is the purpose of this article to explain these various symbols, as the next progressive step in this series of articles treating with electricity and magnetism. The symbols and their meanings should be committed to memory so that the reader may readily recognize them when consulting a diagram.

With reference to the accompanying table, the symbols are located by letter and number, as follows:

- A—1 Dry Cell
- A—2 Battery of Cells
- A—3 Fixed Resistance
- A—4 Rheostat
- A—5 Potentiometer

- C—1 Untuned Inductance
- C—2 Tuned Inductance
- C—3 Tuned Inductive Coupling
- C—4 Variable Inductance
- C—5 Untuned Inductive Coupling

- E—1 Fixed Condensers
- E—2 Leyden Jar
- E—3 Variable Condensers
- E—4 Single Pole, Double-throw switch
- E—5 Double Pole, Double-throw switch

- G—1 Compound Generator
- G—2 A.C.-Y-Connections
- G—3 A.C. Delta Connections
- G—4 Motor Generator Set
- G—5 A.C. Generator

- B—1 Ammeter
- B—2 Voltmeter
- B—3 Galvanometer
- B—4 Wattmeter
- B—5 Watt-hour-meter

- D—1 Transformer
- D—2 Transformer With Two Secondaries
- D—3 Transformer With Center-Tap Secondary
- D—4 Auto-Transformer
- D—5 Induction Coil

- F—1 Photo-electric Cell
- F—2 Voltaic Cell
- F—3 Storage Battery

- F—4 Shunt Generator
- F—5 Series Generator
- H—1 201 A—301 A Vacuum Tube
- H—2 222 Tube
- H—3 224 Tube
- H—4 227 Tube
- H—5 Half-Wave Rectifier Tube
- I—1 Full-Wave Rectifier Tube
- I—2 Gas-Filled Rectifier Tube
- I—3 Carbon Filament Lamp
- I—4 Neon Lamp
- I—5 Microphone

In the preceding article of this series we saw how electric currents may be compared with a stream of water. In order that water may flow down a mountainside, a mountain lake is necessary to supply the water pressure. The water flows at a certain rate, depending upon the pressure behind it as well as upon the opposition offered to it by the rocks and stones in its path.

In the electrical circuit the battery is the electrical pressure (which compares with the mountain lake), that drives the electric current through the wires which have their molecules so arranged that they offer electrical opposition in the same manner as the stones offer opposition to the stream of water.

### The Voltmeter

As we are interested in measuring the pressure of water and its rate of flow, so are we interested in measuring the very same things in electrical circuits. The *voltmeter* is the instrument commonly employed for measuring the electrical pressure of a battery. It measures volts, the standard unit for electrical pressure. This instrument employs magnetism as well as electricity; and it is here that we utilize the data contained in the last installment of this series.

A horseshoe magnet which has been permanently magnetized is mounted in such position that a small coil may be pivoted between its poles. We have noted previously that an electric current flowing through a wire is always accompanied by a magnetic field. Now, if we connect a fixed coil of wire in series with this pivoted movable coil, the electrical opposition will be so high that only a small current will flow through this pivoted armature which is surrounded by the magnetic field of the horseshoe magnet.

Now, if we connect the ends of these windings to the terminals of a battery, a small but sufficient amount of current will flow through the movable coil which builds up a magnetic field in the coil having such polarity that it reacts with the fixed magnet's field, in accordance with the law of

	1	2	3	4	5
A					
B					
C					
D					
E					
F					
G					
H					
I					

†Instructor of Physics, Stuyvesant High School, New York City.



magnets, and thereby produces a deflection of the needle over a scale which is calibrated in terms of volts. This reading indicates the electrical pressure which drives the current through the resistance.

#### The Ammeter

The *ammeter* measures the flow of current in the circuit and is read in terms of amperes. This instrument must of necessity have all the current pass through it that passes through the external circuit, hence it must be so arranged that it may be placed in series with the several parts being measured. In this respect it differs from a voltmeter, which has a high resistance and is placed in parallel with the external circuit.

In most other respects the *ammeter* resembles the voltmeter, having a horseshoe magnet and a pivoted movable coil. Since it is inconvenient as well as impractical to make a coil of extremely low resistance, a common practice is to use an ordinary voltmeter coil which has a solid bar of good conducting metal connected in parallel with it. This bar is called a *shunt*, because it constitutes a parallel or divided circuit with the coil, and, having a good conductivity, or low resistance, it permits most of the current to pass through it, leaving only a small amount of current for creating the magnetic field in the coil which will react with the horseshoe magnet to produce a deflection of the needle on the scale of the meter, which is read in terms of amperes.

*Milliammeters* are extensively used in electrical circuits to measure one-thousandth of an ampere. *Microammeters* are also used, although less extensively, and they measure one-millionth of an ampere. These instruments differ only slightly from the ordinary ammeter, namely, in the delicacy of the bearings, the increase in the number of ampere-turns on the coil to create a strong magnetic field with a weak current, and a corresponding reduction in the size of the shunt so that more current will flow through the windings than through the shunt. Millivoltmeters are sometimes employed in measuring one-thousandth of a volt.

These instruments behave like an ordinary voltmeter, with the exception that a strong horseshoe magnet and many turns having high resistance are necessary.

The *vacuum tube voltmeter* is a form of measuring instrument which measures small voltages without consuming any current from the battery under test. This device consists of a vacuum tube so calibrated that a small voltage, either alternating or direct current, impressed upon the grid of the tube will produce a corresponding change in a milliammeter which is connected in the plate circuit of the tube. These milliammeter readings are interpreted in terms of

### Admissions Double in 5 Years

An interesting comparison of the totals of motion picture theatre admissions from 1926 to 1930, inclusive, is made in a recent report by the Motion Picture Section of the U. S. Department of Commerce. These figures follow:

1926 (silent) .....	\$625,000,000
1927 (silent) .....	\$750,000,000
1928 (50% sound) ....	\$1,000,000,000
1929 (75% sound) ....	\$1,300,000,000
1930 (all sound) .....	\$1,560,000,000

volts. This instrument possesses an advantage over other instruments in that it consumes no current during the period of test.

#### The Galvanometer

The *galvanometer* is an instrument which is used in many forms. It is intended primarily for measuring small currents which are too feeble to operate an ordinary ammeter or voltmeter. Its construction resembles the latter instrument. It has many turns of fine wire and is placed in the field of a powerful horseshoe magnet supported by delicate jewelled bearings or suspended from a very fine wire.

These instruments are delicate enough to indicate currents in fractions of a microampere, as would be ordinarily produced by a photo-electric cell.

#### The Wattmeter

The *wattmeter* may be considered as being a "cross" between an ammeter and a voltmeter. Since a watt is a unit of power, this unit is found by multiplying an ampere by a volt. Hence, an instrument which contains within itself an ammeter and voltmeter can measure power in watts.

Referring to B4 in the accompanying table, there is shown a fixed coil, which is the ammeter connected in series, and the movable coil, or voltmeter, which is connected in parallel. When power is used, both coils react with each other and give a reading which is directly proportional to the number of watts being consumed.

The *watt-hour-meter* is a modification of the wattmeter, and is used to make a continuous record of power consumed. It differs from the wattmeter only in the respect that provision is made for the movable, or voltmeter, coil to rotate continuously. This is done by means of a commutator which periodically reverses the direction of the current through the movable coil, thereby permitting uni-directional rotation. If a commutator were not there, the coil would oscillate back-and-forth when connected to an alternating current circuit.

The same watt-hour-meter may be used to measure either direct or alternating current, for in the case of

the latter the current reverses its direction in both coils simultaneously, thereby not affecting the direction of rotation.

#### Inductance and Capacity

When we study alternating currents we shall see the very great importance of *inductance* in the scheme of things electrical. For example, a certain coil of wire, when connected to a direct current circuit, was found by experiment to have a resistance of one-tenth of an ohm. When connected in an alternating current circuit this same coil of wire displayed a resistance of 700 ohms—which may appear very strange to the uninitiated but which will appear very clear and simple as we delve deeper into our subject. (See table under C.)

By *capacity* in an electrical circuit is meant the ability to do some electrical work. Condensers (see E in table), are some of the forms commonly used. These, too, behave in an unusual way. For example, a direct current is unable to pass through a condenser, whereas an alternating current finds its way through very easily. Capacities may be fixed or variable, depending upon the purpose of the condenser. The *farad* is the unit of capacity, but as this unit expresses a comparatively large quantity, the *microfarad* and *micro-microfarad* are commonly used.

#### The Transformer

The *transformer* is an apparatus which will change a low A.C. voltage to a high A.C. voltage, or a high voltage to a low voltage. Some people have the false notion that a transformer can be used to gain energy. Unfortunately this is not the case, for it is *power* that counts. Power is expressed in terms of watts; watts are expressed in terms of volts multiplied by amperes. If we use a transformer to step-up a voltage, we correspondingly step-down the effective current, and conversely. As a matter of fact, we never get out of a transformer the wattage which we put into it, owing to the fact that there are losses in the iron core during the period of transformation.

#### The Motor and Generator

The motor and generator are identical in most respects. It is simply a question regarding what we want the machine to do. If we put electrical energy into the machine, and take out mechanical energy, we are using the apparatus as a motor. If we put mechanical energy into the machine and take out electrical energy, we are using the apparatus as a generator. If we desire to take out direct current from a generator, we merely correct the current, which is ordinarily alternating, by using a commutator. If we desire alternating current, we merely connect brushes to slip rings



and take the current out as an alternating current. Vacuum tubes are frequently used to rectify alternating current to direct current. A converter is sometimes used to accomplish the same results.

#### The Vacuum Tube

We could go on indefinitely describing the various devices available today in the way of electrical machinery, but we must not delve too deeply into the principles of operation of each instrument until we have become more familiar with the instruments and equipment used in electrical circuits. When we have arrived at a more advanced stage, we shall consider thoroughly the more difficult phases of electricity.

The vacuum tube is the building stone of all our amplifiers and speech transmission systems today. Without it, such developments as radio, sound motion pictures, and television would be impossible. The vacuum tube depends, as most of us know, upon the "Edison Effect," which, simply stated, means the emission of electrons from a filament of wire which is heated to redness. Fleming was an ingenious worker who introduced the use of a plate in a vacuum and connected it to the positive side of a high voltage battery. Following the law that electrons which are negative may be attracted to the positively-charged plate, he invented the "Fleming Valve." Subsequently the grid was introduced by Dr. Lee De Forest, and this addition served effectively to control the quantity of electrons which may flow

from the negative filament to the positive plate. Thus was developed the three-element tube. Incidentally, this same tube also may be used to rectify alternating current to direct current, or as an amplifier or speech modulator.

Screen grid is merely a meshed gauze which is charged at a lower positive potential than the plate; hence, electrons are attracted by the screen grid which is located nearer to the filament than is the plate. As soon as these electrons come near the screen grid they immediately come under the influence of the more positive plate and are accelerated through the meshed screen grid to the higher potential plate. As a result, electrons are emitted more profusely by the filament and are disposed of rather than left to accumulate about the filament and thus obstruct the further emission of electrons by the filament.

Filaments are commonly heated by batteries whose voltages run from 1½ to 7½ volts. Most battery-operated tubes have filaments that are made of tungsten. Some of the more modern tubes that are designed for alternating current operation have filaments that are coated with oxides of metals which permit an abundant emission of electrons. These type tubes may be distinguished by their dull glow. Other tubes have indirect heating elements which merely heat a cylinder that is oxide coated, thereby providing a source of electrons without introducing the hum which is prevalent in alternating current.

(To be Continued)

## Common Occupational Ailments of Projectionists

By SAMUEL LUBIN, M.D.

IT IS not the purpose of the writer to attempt to teach the fundamentals of medicine to his readers, but merely to bring to their attention certain general conditions which bear a real relationship to their occupation. In setting forth these fundamental facts, the opportunity to do which was kindly afforded by the editor of MOTION PICTURE PROJECTIONIST, certain ideas are stressed and these are: (1) that many conditions of ill-health can be prevented; (2) that good physical condition must be maintained in order to ward off and effectively combat illness; and (3) that the projectionist should be made aware of certain possible irregularities arising from the character of his work and should furthermore be prepared to treat minor injuries in an emergency.

#### Most Common Ailment

After having examined and treated several hundred projectionists, I may be permitted certain observations respecting the health of those engaged in this occupation. It has interested me greatly to note that most of the ailments of those within this group

may be classified under several distinct headings.

Let us first consider the projectionist's most common disorders: diseases of the air passages and lungs. This includes the passage from the nostrils to the lungs, which is composed of the following, in their proper order:

1. Nasal passages
2. Nasal part of the throat
3. Oral part of the throat
4. Larynx, or voice-box
5. Bronchial tubes
6. Lungs.

Although these parts are six separate entities, an individual is seldom affected without more than one of the six parts being involved. One of the most common irritants to the lining membrane of these organs is the dust contained in impure air, with which is naturally associated an absence of sunlight. This state of affairs prevails in most projection rooms to a greater or lesser extent, dependant upon several factors. These factors are determined by the type of ventilation, the cleanliness of the room, the amount of tobacco smoke in the air,

the gases produced by the heated carbon points, etc.

Most projectionists are constantly exposed to the bad effects of these existing physical states during their hours of employment. Some of the more common illnesses affecting the air-passages and lungs are:

- |                 |               |
|-----------------|---------------|
| 1. Cold in head | 4. Laryngitis |
| 2. Catarrh      | 5. Bronchitis |
| 3. Sore throat  | 6. Pneumonia  |

Of these, the ailing projectionist in a great majority of instances is afflicted with a mild bronchitis, usually of a chronic nature; a laryngitis and hoarseness, or an irritated throat. The remaining respiratory illnesses usually are of a more acute nature, which can easily be obtained with the underlying irritation already present to invite further trouble or complications.

#### Preventative Measures

What can be done to reduce illness due to the above-named factors? Results may be obtained only by co-operation between employer and projectionist. The former will have discharged his duty by complying with all health laws relating to proper ventilation of the projection room and by seeing to it that the projectionist receives a plenitude of pure air without being subjected to draughts. The projectionist himself can help by availing himself of every opportunity to enjoy fresh air and sunshine, in order to counteract the effects of the impure air and darkness prevalent during his working hours.

Fresh air and sunshine are easily obtained, and they constitute the best line of defense against all respiratory infections. It would be well to set aside at least one hour every morning for a short walk, preferably through a park or along a waterfront. On one's day off, several hours might possibly be spent in the open. Other precautions should include a physical examination to determine the condition of the nasal passage—all nasal obstructions should be removed; infected tonsils should be either treated or removed; tobacco smoking should be kept within reasonable limits; and the throat should be gargled daily before retiring with some mild antiseptic solution, such as salt water, Listerine, or peroxide.

It is taken for granted, of course, that one would take care of his health generally, in addition to the foregoing specific suggestions. This would include a proper amount of sleep in a well-ventilated room; good wholesome food at regular hours each day; proper elimination of body waste-products; and careful general personal hygiene.

#### Time and Type of Meals

The next most common group of ailments peculiar to projectionists includes those of the stomach and intestines, the disorder of which sets up conditions which are absolutely



avoidable. The average man, and particularly the motion picture projectionist because of his unusual hours of employment, not compatible with normal daily routine, will get into poor habits in relation to his eating periods. The projectionist should observe a regular daily meal schedule and partake of plain, wholesome food, being sure to drink a generous quantity of water during the day. It would be wise to arrange the time of the heaviest meal of the day so that it would not come just before bedtime, a dining time so much preferred by many projectionists. The most suitable time for dinner would be in the late afternoon or early evening, with a light supper being permissible before retiring.

Here again reference must be made to the importance of outdoor exercise, fresh air, and sunshine as an aid to general health, as these are very important factors in aiding the proper digestion of food and the evacuation of waste-products. Attention to this suggestion will help materially in preventing dyspepsia, indigestion, constipation, and related ailments.

A few words anent the care of the eyes would not be amiss here. Never look into glaring lights without properly shading the eyes from the harmful effects of the bright rays. An oculist or eye specialist should be consulted at the first suggestion of possible eyestrain. Eyestrain will manifest itself by a number of symptoms, the most easily recognizable of which are redness of the eyes, an aching feeling in the region immediately above the eyes, headache after reading, an inability to see clearly, a blurring of vision, etc. Examination by a physician will disclose the trouble and indicate the remedy.

#### Burns Head Injury List

A majority of the common injuries sustained by the projectionist are burns. The best advice in this case, other than the retention in the projection room of proper fire-fighting facilities, would be for every projection room to be equipped with a complete first-aid kit. This kit should contain the usual household remedies for minor injuries, and should be replenished immediately following the use of any of its contents. A first-aid kit is of no value unless replacements of used materials are made, for the very item wanted in an emergency may be missing. A general idea of the contents of such a kit would be as follows:

Iodine	Bandages
Peroxide	Gauze
Medicated alcohol	Absorbent cotton
Mercurochrome	Adhesive plaster
White vaseline	A tourniquet
Unguentine	Boric acid
Aromatic spirits of ammonia	

A word of warning regarding the use of iodine. Iodine should be ap-

plied lightly and not rubbed into the skin. It is well to go over the area, covered with iodine, with some medicated alcohol to prevent possible iodine burn, which so often occurs as a result of its injudicious use. Mercurochrome (2% solution), should be used in preference to iodine for open wounds, because it is as powerful an antiseptic and does not sting the flesh when used.

While one is attending the injured in an emergency, another party should be getting a physician, because there is no way of determining at the moment whether the injury will prove serious, and the presence of a physician at the earliest possible moment may save the injured person much later trouble.

### Selected Technical Glossary

Appended hereto is the third installment of the selected technical glossary recently promulgated by the Academy of Motion Picture Arts and Sciences. It has been pointed out previously that there will inevitably be differences of opinion and recognized practice in the application of many terms, and therefore users of the glossary are cordially invited to call to the attention of the Technical Bureau of the Academy errors and suggested additions, so that by periodic revision the glossary may be kept authoritative and up-to-date.

The first installment of this glossary appeared in the March issue; the next installment will appear in the July issue.

#### L

**LABORATORY.** Usually means place where films are developed and finished.

**LACQUER.** Varnish, either colored or transparent, with which nearly all camera parts are coated for protection and finish.

**LAMBERT.** Unit of brightness. Equals the average brightness of a surface which emits or reflects one lumen per square centimeter of surface.

**LAMINATED.** Formed of a number of thin sheets.

**LAP-DISSOLVE.** See DISSOLVE.

**LARYNX.** Organ of voice, situated at upper part of windpipe. Consists of a box across which are stretched the vocal cords which, by vibration, produce sound.

**LATENT IMAGE.** An invisible image, on a photographic emulsion, which exists due to the chemical reaction produced in the emulsion by exposure to light.

**LATITUDE.** Range of exposure obtained by projecting the straightline portion of the H and D curve onto the exposure axis. A measure of the range of exposure for which the value of gamma is valid.

**LEADER.** That part of the print from the beginning to the first frame of picture.

**LEAK, GRID.** See GRID LEAK.

**LENS, CENTER.** See CENTER LENS.

**LENS, COLLECTING.** See COLLECTING LENS.

**LENS, COMPOUND.** Combination of a number of simple lenses.

**LENS, CONVERGING.** See CONVERGING LENS.

**LENS, OBJECTIVE.** See OBJECTIVE LENS.

**LENS, PROJECTION.** See PROJECTION LENS.

**LENS, RECTILINEAR.** SEE RECTILINEAR LENS.

**LENS, SIMPLE.** Lens consisting of but a single piece of glass or other transparent medium.

**LENS, TELEPHOTO.** See TELEPHOTO LENS.

**LENS, WIDE-ANGLE.** Short-focus lens which takes in a wide field of view, from 75° to 100°. See VIEW, ANGLE OF.

**LENS AXIS.** Same as OPTICAL AXIS, for a lens.

**LENS BARREL.** Metal tube in which a lens is mounted.

**LENS BOARD.** That part of the camera on which the lens is mounted.

**LENS HOOD.** Tube or box designed to protect the lens from light not wanted in the image, such as strong side lights or direct sunlight.

**LENS MOUNT.** In many cameras the lens is also the focusing device.

**LEVEL.** Refers to loudness. See also SENSATION LEVEL.

**LIGHT FLUX.** See LUMINOUS FLUX.

**LIGHT-VALVE.** An apparatus for transforming small variations in an electric current into variations in the width of a beam of light transmitted by the apparatus.

**LINE OF FORCE.** See MAGNETIC FIELD.

**LINEAR.** Two quantities are said to have a linear relation when multiplying one by a given factor automatically multiplies the other by the same factor. Thus, there is a linear relation between the distance a car travels and the number of times its wheels revolve.

**LIVE STAGE.** (1) Stage enclosed by materials which do not absorb much of the sound from within the stage. (2) stage in use or held for use, and usually so marked.

**LOAD.** The amount of electric power being drawn from the generators or mains.

**LOADED.** Of sound or camera magazines; filled with film.

**LOADING COIL.** Type of inductance coil.

**LOCK 'EM UP.** Generally a command to close up camera booths with cameras and men inside so noise will not affect microphones.

**LOGARITHM.** If  $x$  is raised to the  $y$ -th power equals  $z$ , then the logarithm of  $z$ , to the base  $x$  is  $y$ .

**LOGARITHMIC INVOLUTE.** A kind of spiral curve, as on a phonograph record.

**LOGARITHMIC RELATION.** If multiplying one quantity by a given factor automatically multiplies another quantity by the logarithm of that factor, the relation between the two quantities is logarithmic.

**LONG-SHOT.** A scene photograph, utilizing the entire angle of the view of the camera lens, with the lens focused for objects at practically infinite distance. Long-shots include scenes which are general in their character—scenes of wide scope; the general assemble; the full room with all characters included; full length exterior scenes; landscapes with characters included; etc. For long-shots, lenses of short focus—two inches to about one inch—are generally used.

**LOOPS** are left between the two sprockets, in photography, printing, or projection, to permit the part of the film which is being exposed to have the necessary intermittent motion.

**LOSS.** (1) Any piece of apparatus which decreases the energy output of the circuit in which it is placed. (2) Ratio of output to input energy, in such a case.

**LOST.** (Colloq.) Not functioning.

**LOUDSPEAKER.** Device which, receiving an amplified varying electric current, transforms the current vibrations into mechanical vibrations, thus setting up sound waves.

**LOW-PASS FILTER.** See FILTER, LOW-PASS.

**LUG.** Metal wire terminal.

**LUMEN.** Unit of luminous flux. A source, whose luminous intensity in all directions is one candlepower, emits  $4\pi$  lumens.

**LUMINOSITY CURVE.** For any light source, a curve showing the variation of emitted light with wave-length (color) along the spectrum.

**LUMINOUS FLUX.** Equals amount of luminous energy flowing per unit time. Luminous energy represents light energy evaluated according to the luminous sensation produced in the human eye.

**LUMINOUS INTENSITY.** The luminous intensity of a light source in any direction, is the luminous flux per steradian (unit solid angle) in that direction.

#### M

m Abbreviation for METERS.

(Continued on page 39)



# Continuous Non-Intermittent Projectors

By ARTHUR J. HOLMAN

*Readers of this publication will recall the very interesting series of articles by A. J. Holman on continuous projection which appeared in these pages during 1930<sup>1</sup>. The accompanying article, which appeared in the Journal of the S.M.P.E. for May, 1931, contains much additional data on this most interesting of all projection topics and sets forth certain advances which have been made recently in this branch of motion picture mechanics.—Editor.*

**I**N a former paper<sup>1</sup> the ideal projector was defined as having "an optical system capable of producing uniform maximum illumination over the entire surface of a screen, and having the capacity to modify the intensity locally in proportion to the density of the corresponding part of the film frames which are passing continuously over the aperture plate." The ideal projector is not defined in terms of any particular mechanism or even in terms of any particular type of optical system, but it is defined in terms of the light picture it paints on the screen as the film moves uninterruptedly across its aperture plate.

From the very nature of things it is evident that screen images produced by the ideal projector are alive and dynamic, since outlines of moving objects are continually shifting, due to the continuous dissolving action. But even if the ideal projector did not provide this mobility of image and many other advantages incidental to the dissolving action, it is worthy of the name because it substitutes uniformly lighted, non-periodic screen images for the lightning-like flashes shot at the screen forty-eight times a second by intermittent projectors.

Turning for a moment from the ideal projector to its product, ideal projection, let us illustrate the only kind of projection that may be properly termed ideal. In order to do this, let us go back to the days before the movies became popular, when stereopticon lectures were in vogue.

First of all, the hall was usually quite dark during the exhibition, not because of any particular consideration of glare spots but primarily because it was difficult to provide a bright screen image for any considerable period without damaging the slides. Imagine sitting in such a hall and looking at a beautifully colored scene. On the screen, the sky is brightly lighted but there is no ap-

pearance of scintillation; the full details are distinguishable even in the dark recesses between the rocks along the shore; there is no appearance of graininess anywhere in the scene, not even in the intermediate halftones; all the natural gradations of light and color are there before the eyes and the illusion is as perfect as a one-eyed view can ever be, except that all moving objects, such as the waves, the spray, boats at anchor, and the trees, are as static as if the scene were cast in plaster.

## What is Ideal Projection?

Now imagine that the screen image becomes mobile and dynamic; the waves roll and break on the shore, the spray shoots up and falls naturally, boats bob and toss and the trees bend in the breeze. In all other respects the scene retains its former characteristics; no scintillation in the highlights, no stroboscopic effect, no plugging up in the shadows, or other disturbance to the natural tone, no gradations, no appearance of graininess, no more eye-strain or nerve fatigue. This is *ideal* projection—the product to be expected of the ideal projector. Truly, it seems product of the imagination, but many, who have been experimenting with continuous, non-intermittent projectors, have really seen and have become accustomed to motion picture projection which reaches far up toward this ideal, and in comparison to which intermittent projection is a hopeless make-shift.

The subject is revolutionary. Scores of devices have been constructed both

here and abroad, but these have fallen so far short of the ideal in performance, that the motion picture industry, observing endless failures, has almost entirely ceased to hope for and dream of fundamentally improved projection. Revolutionary attainments are often not in the least appreciated. It is surprising to find out how well satisfied the industry is, in general, with intermittent projection. It is only when it is emphasized that motion pictures are tiring to the eyes, produce nerve fatigue, and may even cause permanent injury, especially to children's eyes, that the industry girds itself to combat such propaganda.

The arguments offered by spokesmen for the industry and much of the scientific data offered as evidence that motion pictures do not cause eye-strain are really amusing in view of the facts which any intelligent observer can easily discover for himself. The lightning-like flashes shot at the screen by intermittent projectors produce entirely unnatural illumination. We are so constituted, both physically and mentally, that the unnatural and the unaccustomed are fatiguing, especially if we are exposed to their effects for long periods. When we think of the well-known phenomenon of retinal fatigue, it is not at all surprising that intermittent screen images differ materially in appearance and in their effect on the eyes of the observer, from continuous, non-periodic screen images and that the latter

## Fake Subscription Solicitors

**RENEWED** activity by certain canvassers who represent themselves to be subscription agents for MOTION PICTURE PROJECTIONIST necessitates repetition of past warnings in connection with this matter. MOTION PICTURE PROJECTIONIST has no subscription representatives, and anyone representing himself to be an authorized agent is an imposter. Subscriptions may be placed only through your Local Union office (usually with the Secretary), or direct to the office of publication at 7 West 44th St., New York City. Subsequent to the appearance of this notice, MOTION PICTURE PROJECTIONIST will not be responsible for any subscription taken by any agent outside of your Local Union. The attention of your Local Union Secretary should be directed to this notice.

## MOTION PICTURE PROJECTIONIST

<sup>1</sup>"Revolving Lens Wheel Projector," Motion Picture Projectionist, Vol. 3, No. 10, August, 1930; "Prospects for Non-Intermittent Projection," Vol. 3, No. 12, October, 1930. "Why and How of Continuous Projection," Vol. 4, No. 1, November, 1930.

<sup>2</sup>Exhibited at the Spring Meeting of S. M. P. E., Washington, D. C., May, 1930.



are more pleasing and less fatiguing to look at.

Much could be written on the advantages of non-intermittent projection, but to date the subject has not been carefully studied or investigated, and why should it be, or rather, how could it be, till some inventor brings forth a practical non-intermittent projector? It is dangerous to discuss the ills of intermittent projection till the industry is provided with better means for exhibiting its product.

Non-intermittent projection, being such a dangerous subject, has had little consideration from the industry in the past year, as is evidenced by the fact that the demonstrations last year<sup>2</sup> of the revolving lens wheel projector has had little or no effect in clearing up the "mystery" surrounding "continuous projection." As a matter of fact, there is no mystery about optical rectifying systems, except that which some unscientific sponsor of a particular apparatus may purposely create around one or another aspect of his device to avoid disclosing the inherent defects of his system. This paper is presented in an effort to clear up some of this "mystery" surrounding apparatus embodying the principle of variable refraction, which principle, as has been observed, offers the most promising means for providing ideal projection.

The principle of variable refraction has become so popular with inventors that practically all recent patents on optical rectifying means and all the latest "continuous projectors" appearing in this country embody variable refraction in one form or another. Most of the recent devices use multiple moving lens elements and these are circulated through the light beam. In general, these devices may be classified under two headings: first, devices wherein the lens-feeding mechanism handles each lens element individually, and, second, devices wherein the individual lens elements are rigidly mounted on a rotatable structure and are carried through the light beam by the rotation of the structure as a whole.

Devices coming under the first classification have been developed, notably in England, France, and Germany, and several of them have been brought to this country. The revolving lens wheel projector, representing the rigid optical structure, has been developed exclusively in this country.

Inventors providing lens-feeding mechanisms which handle the moving lens elements as individual units, undertake a very difficult mechanical and optical problem because they believe it is essential, at all costs, to provide the optical arrangement described previously<sup>1</sup> as the "perfect system," namely, "a stationary front optical element and a continuous procession of rear elements, all equally

spaced and moving downward at a constant linear velocity over a straight path at right angles to the axis of the stationary element."

The designer of the revolving lens wheel mechanism provides a rigid mounting for the moving lens elements thereby causing these elements to travel on a fixed circular orbit which is so arranged and located with respect to the axis of the fixed optical element, that the errors, introduced by causing the moving elements to travel at constant angular velocity through the active zone on the fixed orbit instead of along a straight path at uniform linear velocity, as in the above-described "perfect system," are negligible.

Inventors essaying the "perfect system" are faced with the problem of providing straight line motion and uniform linear velocity for each moving lens element during its passage through the bundle of rays which has passed through the film overlying the aperture plate. The total number of lens elements is limited by cost and other practical considerations, hence it becomes necessary to pick up the individual moving lens elements at the end of the straight path and return them, over a conveniently short curved path, to the starting point of the straight path. This simple circu-

lation of the moving lens elements does not sound difficult of accomplishment, but when one considers with what precise accuracy it must be performed, one must admire any inventor's courage in assuming the task of constructing such a precise mechanism.

#### A Difficult Mechanical Problem

The mechanical problem is so extremely difficult that designers, not familiar with the optical problem, or at least not recognizing its supreme importance, have contented themselves with mechanisms designed to circulate small lens elements having circular apertures. In such devices the lens elements must be housed in cells which further cut down their effective apertures to such an extent that all the light transmitted to the screen by such systems must pass through a lens aperture scarcely more than five-eighths of an inch in diameter.

It is difficult to conceive how anyone in the least degree familiar with projection lenses could ever hope to transmit the immense amount of light required to illuminate the modern theatre screen through lens elements of such small aperture. The cells, wherein the moving lens elements are mounted, present fully as much

## Racketeering 'Labor Unions'

(I. A. General Bulletin No. 262)

LABOR since the dawn of creation has been exploited in divers manners. Each succeeding generation has developed some new system whereby the toiling masses are exploited. The gentry have little or no concern for wage earners.

It has been our good fortune to have been rather free from racketeering elements who have generally preyed upon legitimate trade union organizations. Of recent times we have noted an insidious spread of "Labor Racketeering" in the form of incorporated so-called "Labor Unions," chartered by the several States, who set forth in their application that the purpose of such corporation is to improve the conditions of the wage earners covered by the incorporation application papers. Particularly have such corporations embraced the jurisdiction of Motion Picture Machine Operators. As a matter of fact, these alleged "Labor Unions" are nothing more or less than racketeering strike-breaking institutions. These pseudo labor organization promoters go so far as to even closely copy the name of our organization.

There has been too much tolerance shown this condition by the several Local Unions in whose jurisdiction these "Racketeers" have attempted to establish themselves. No quarter should be given them. The moment such a movement gets under way in any jurisdiction of our International

Alliance, immediate, proper and aggressive steps must be taken to thoroughly and instantly eradicate these scavengers.

If a Local Union will permit a non-union condition to obtain in even a few local theatres, it may form the nucleus for the establishment of such a strike-breaking institution. The present time affords the finest opportunity that has been presented in many years to unionize non-union theatres. The fact that any Local Union has even one non-union theatre in its jurisdiction is sufficient cause to immediately proceed with a campaign that will eventuate in the establishment of a 100 per cent organized condition throughout such local jurisdiction.

It is a fine thought for any Labor Union to always keep its membership geared up to meet every eventuality. Labor organizations should always be in training and prepare to fight along legitimate lines when conciliatory action fails to bring about the desired results. The Local Unions of the Alliance have been just a bit too peaceful during the past two years for their own well-being.

The General Office urgently requests each and every Local Union to put forward extreme efforts in establishing a 100 per cent organized condition in each and every local jurisdiction.



opaque area, in passing through the light beam, as the lenses present transparent area, hence the passage of the lenses through the light beam is accompanied by considerable shutter effect. It is quite obvious that such systems do not offer the least possibility of producing the screen images required of the ideal projector. We may conclude that such devices are optically and mechanically impossible.

Variable refraction, after the fashion of the "perfect system," offers far more obstacles and far less chance of success than does the variable reflection principle with its multiple, individually tilting, rotating mirrors which can be made to function quite well, at least when the mechanism is new.

#### Revolving Lens Wheel System

On the other hand, what are the possibilities of the revolving lens wheel system and what are its inherent errors? In the first place, the system is based on the theory of limits as outlined in the differential calculus, which simply means that the system may be designed to approach as closely to the theoretical accuracy of the "perfect system" as we may desire, *i. e.*, the inherent residual errors may be made as small as we are pleased to have them. In practice the system is so designed that the residual errors are insignificant as compared to errors inherent in the mechanical structures, as, for instance, the errors which are present even in sprockets of the highest precision, or the errors inherent in any rotating apparatus, which errors are due to the presence of running clearance in the bearings.

Hence, for all practical purposes, and in so far as can be determined by measurements of the screen image, the revolving lens wheel system is as accurate as the "perfect system." The theory proves that the revolving lens wheel system is possessed of that precise accuracy which is a fundamental requirement of any apparatus or optical system designed to provide such precise placement of successive screen images as is required to produce a smooth, dissolving action between successive film frames.

The advantages gained by rigidly mounting the moving lens elements are quite obvious. Once these elements are located on the lens wheel, their spacing is established and subsequent wearing of the mechanism in service cannot change or alter it in any way. This is a very important factor, for any variation whatsoever in the spacing of the moving lens elements causes the screen image to become unsteady. But what is of even greater importance, the rigidly mounted elements are moved over a fixed orbit and the only motion required to provide the precise image

placement theoretically possible with the system, is pure rotation.

#### A Minimum of Wear

Rotative movement is relatively easy of accomplishment, and, since all the moving lens elements are rigidly supported on one rotating member, it is obvious that subsequent wear in the lens-feeding mechanism is confined to the two bearings supporting the rotating member. Hence there is very little likelihood that wear in the mechanism will cause variation in the alignment or in the angular velocity of the moving lens elements as they pass through the light beam. Thus, wearing of the working parts of the mechanism in service is reduced to a minimum, and, furthermore, whatever wear may occur is not liable to affect the steadiness of the projected image. Since no movement other than pure rotation at constant angular velocity is employed in the revolving lens wheel projector mechanism, it is obvious that such mechanisms will be quiet in operation and will remain quiet throughout years of service. The simplicity and inherent accuracy of the revolving lens wheel system and its obvious freedom from deterioration due to wear easily establish its mechanical superiority.

The aperture of the moving lens elements in the revolving lens wheel system is not limited by mechanical considerations. Moreover, these elements are mounted in such a way that no opaque substance whatsoever is caused to pass through the light beam. The entire periphery of the lens wheel, which passes through the light beam, is composed of glass. The individual lens elements, which compose the periphery of the wheel, are so formed and located that they constitute a composite unbroken band or ring of glass.

Thus, this system provides the full normal aperture, the equal of the effective apertures of standard projection lenses for any and all angular positions of the lens wheel elements, and, furthermore, the system is free from all shutter effect as the lens wheel rotates. It is for these reasons that the revolving lens wheel system of projection is capable of delivering ideal projection.

#### Improved Design Ready

The proof of the accuracy of the fundamental theory of the revolving lens wheel system has been satisfactorily demonstrated time and again with the two-lens wheel projector formerly described<sup>1</sup> and exhibited last year.<sup>2</sup> Within the past year or so the writer has invented an improved revolving lens wheel system which requires but one lens wheel and, for given over-all machine dimensions, provides a closer approach to the theoretically perfect machine than does the two-lens wheel design. In-

cidentally, the new single orbit design lends itself very nicely to both projector and camera construction, providing, in each case, a simple, compact, and convenient structure.

In the two-lens wheel design there are three elements to be kept in synchronism, namely, the two lens wheels and the film. In the new single-lens wheel design, it is only necessary to maintain synchronism between the one lens wheel and the movement of the film across the aperture plate. Hence the number of gears and the complexity of the gear train are reduced in the single lens wheel machine, all of which makes the new design cheaper to manufacture and more accurate in performance.

It is hoped that this paper will be helpful and illuminating to those unfamiliar with "optical rectifying systems" or "continuous projectors," as they are commonly called, and that it will be instrumental in clearing away the "mystery" surrounding the subject, thus opening the way for serious scientific consideration of the one system of projection which offers great promise of fundamental and revolutionary improvements in the art of recreating the true appearance of motion in either black and white or true color images.

#### Studios Urged To Keep Reel Footage at Proper Length

The recent meeting of the Producers-Technicians Committee passed a resolution urging that all studios should instruct their cutting departments to keep reel footage on features between 800 and 950 feet per reel.

Complaints on short reels have been received by the Academy from all parts of the country in connection with the Standard Release Print. A conference was recently called by A. S. Dickinson, Director of the Conservation Department of the Motion Picture Producers and Distributors of America, Inc., in New York. Representatives of Tiffany, Universal, Paramount-Publix, Warner Brothers, R-K-O, and Metro-Goldwyn-Mayer attended. The difficulty resulting from short reels in small houses was particularly stressed.

#### Short Reels Increase Cost

Some studios have been releasing reels as short as 400 feet and frequently less than 600 feet. Short reels increase costs and difficulties throughout the release, particularly in shipping and in exchange inspection.

Short reels also make unnecessary additional work in theatre projection by requiring more frequent changeovers. This encourages the already extensive practice of doubling-up reels, with resulting mutilation of the print.



# Efficient Sound Reproduction

By R. H. McCULLOUGH

*Supervisor of Projection, Fox West Coast Theatres*

**G**RID leaks are made with pieces of paper, fibre or cloth impregnated with, or covered with, some form of carbon. These resistance units are mounted inside of short lengths of glass tubing to which are attached metal end caps which fit into spring clips. Such leaks are quite satisfactory when the internal connections are electrically perfect and mechanically permanent. It is also necessary that the tube caps fit tightly to exclude moisture. Values in common use includes  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$ , 1,  $1\frac{1}{2}$ , 2,  $2\frac{1}{2}$ , 3, 5, and 10 megohms. One of the greatest troubles with grid leaks is the uncertainty and the unreliability of their resistance rating. It is imperative that grid leaks be measured for their resistance value with a meter. There are two grid leaks used in the 49-A amplifier and they are of different values. It is very essential to see that they are in their proper positions.

A grid leak of 2 megohms is used in the photo-electric cell circuit, while one of 10 megohms is required in the grid circuit of the first stage of the amplifier. The 2 megohm grid leak should be inserted in clip marked "R1" and the 10 megohm leak in clip marked "R2." The photo-electric cell grid leaks have been changed in many theatres and many are using  $\frac{1}{2}$  megohm grid leaks, while others are using 1 megohm and 2 megohm grid leaks.

## Care in Threading Film

Great care must be exercised in threading the projector for film reproduction—otherwise, lack of synchronism will be the result. First of all, see that the sound track mask, at the aperture, is in position. When threading a Simplex projector for film reproduction, thread in the usual manner, with the exception that the loop between the intermittent sprocket and the lower sprocket should be such that the film comes just in line with the edge of the mechanism.

For Powers and Motiograph projector mechanisms, allow a two-finger loop between the intermittent sprocket and lower sprocket. There should be a length of  $19\frac{1}{3}$  frames, or  $14\frac{1}{2}$ ", between the center of the projector aperture and the light gate aperture in the reproducing mechanism. In threading from the projector mechanism lower sprocket to the sprocket of the reproducing mechanism always allow a slack of two sprocket holes. This is necessary to take care of any irregularities in the film—otherwise flutter would be encountered if the film were held in a tight plane.

High-voltage filter condensers are capable of holding a charge for a considerable length of time. It is possible, while checking over the amplifier and component parts, that you will receive a severe shock from one of the condensers. A simple method of avoiding such shocks is to make it a practice to always discharge such condensers before handling them. To eliminate the possibility of shocks, take a screw driver, or any other metal conductor, and "short" both terminals, which will discharge the condenser.

## Lubricating Projector Parts

If the reading on the synchronous motor control box meter does not stay within specified limits, check the projector mechanism immediately and also the working parts of the driving attachment. Excessive friction at some point in the mechanism will cause the meter reading to read high on A.C., or two low on D.C. See that the projector working parts are well lubricated at regular intervals.

Test the amplifier equipment daily before starting the performance. After the amplifiers have been turned on, test the disc pick-up by rubbing the needle of the reproducer lightly with the finger. This should be clearly heard in the monitor horn, when the fader is set on the normal operating point. In testing the film pick-up, see that the exciter lamp filament current is at the proper value. Remove the light gate. Move your finger up and down across the light beam—every time this is done a click should be heard in the monitor horn. Test each projector in the same manner.

Never use a battery and buzzer to test lines for "opens" or shorts" in amplifier or reproducer circuits, as this may upset the magnetic characteristics of the coils. Use a head-phone set to test amplifier circuits. Before removing the rear cover of any amplifier, be sure to turn off the power and keep it off until the cover is replaced.

## Proper Volume Control

Usually an observer sits somewhere in the audience and it is his duty to control the volume of sound in the auditorium. The sound must be universally controlled, so as to satisfy all patrons. The sound must not be too loud or too soft. The fixed level with some productions have been very good; however, there are many productions which require constant attention. A cue sheet is usually made up on the first showing. This cue

sheet gives the projectionist an idea for the proper fader settings. Many theatres have installed a fader at some location in the audience. This requires the services of a competent projectionist, and has been found to be very successful. The auditorium observer's station is provided with a hand telephone and a signal box.

A signal code is used between the projectionists and the observer whereby the volume may be controlled without telephoning the projection room. The following signals are standardized:—one buzz—to raise the volume one point; two buzzes—to lower the volume one point; three buzzes—to answer 'phone. The projectionist and the observer can communicate with each other as desired.

If the Western Electric observer's equipment does not function, and if the signals are not loud enough to enable the observer and projectionists to hear each other, or if the buzzer is weak or inoperative, be sure that the batteries are in good condition. Batteries may be changed by opening the battery box by loosening the screw in the cover.

## Sound Optical System

By way of explanation, the light source is the straight coil filament of the exciting or reproducer lamp. The light from the reproducer lamp passes through condenser lenses and is focused at the slit in the form of a spot much in the same manner as the light beam is made to cover the projector aperture. In the side of the slit barrel is a window through which the spot of light at the slit may be observed and adjusted by the projectionist.

The slit cell also carries an objective-lens combination, the function of which is to project an image of the slit in just the right proportion of reduction to the sound band of the film as it passes through the sound gate. It is scarcely more than a line itself, located in a horizontal, not a vertical position. Its image is projected to the sound band in still further reduced form and in correspondingly greater brilliance. It will illuminate each one of the film sound band lines separately, or very nearly so.

The reproducer lamp filament must be adjusted so that it is in correct relation to the optical axis of the sound reproduction light beam. However, after the adjustment has been properly made, it is necessary that the lamp filament be inspected for possible sagging. Sagging of the filament throws it off the optical center



with the axis of the pick-up optical system, so that it will no longer reproduce a proper spot at the slit.

It follows, therefore, that the volume will be affected. The only remedy is the installation of a new lamp. Movietone attachments require careful attention, and a lack of proper attention is one reason why the quality of film reproduction is spoiled in many theatres.

### The Exciter Lamp

The reproducer or exciter lamp is one of the most important factors. A sharply-focused slit on the sound track cannot be obtained if the lamp is dirty. A finger print on the bulb in front of the filament obstructs the image. Dirt of any kind in the filament image path will reduce the volume and, too, certain high frequencies will be eliminated. The filament of the exciting lamp must be absolutely horizontally level to produce best results.

Discoloration of the bulb will cause loss in volume. Discoloration usually appears first at the top of the exciting lamp, which does not obstruct the intensity of the filament image. When checking a lamp for discoloration, remove the lamp holder from the exciting lamp housing and look at the lamp against a white background—this will give you positive proof of discoloration at the top and walls of the globe. Make sure that the glass is perfectly clear and clean in front of the exciting lamp filament; otherwise, loss in volume will be the result.

### Cause of Flutter

There are many things which will cause flutter in sound reproduction. With the first Western Electric sound installations, trouble was encountered with the take-up assembly. Bent take-up reels would cause an uneven pull on the sound sprocket which has caused considerable flutter. This trouble has been corrected by Electrical Research Products, Inc., by installing an additional sprocket, which is installed directly under the sound reproducing mechanism.

This sprocket takes care of any uneven pull, which may be caused by the take-up assembly. Motor and projector couplings should be checked quite frequently—if they work loose, a jerky action will result which will cause flutter. It was found on one occasion that a small piece of lint, which was caught in the sound aperture, caused a very bad flutter in Movietone reproduction.

### Filter System Check

The Western Electric mechanical filter system should be checked occasionally to see that the balancing is correct. Sometimes the mechanical filter system becomes stiff, with the result that it is of no value whatever. The mechanical filter system

requires lubrication, the same as other working parts.

Stray light which is allowed to leak into the photo-electric cell compartment will cause flutter with Movietone reproduction—in other words, if incandescent lighting comes in contact with the photo-electric cell compartment, the cell is capable of picking up the frequency. Dirty sound sprockets will also cause flutter. Flutter is one of the worst enemies to good sound reproduction and it is very easy to avoid this trouble. Film recording and disc recording must travel in reproducing equipment at an even speed without intermittent variations.

Never move the fader from zero before the motor has reached full speed, as this will completely spoil the beginning of speech or music. When the motor is up to speed at the start of a reel, bring the fader up slowly.

### Some Physiological Aspects of Wide Film Pictures

**I**N order to maintain the necessary minimum height of the screen, proper proportions unfortunately call for such width of screen and related minimum viewing distance that the latter produces uneconomical conditions, so far as a desirable theater seat capacity is concerned.

If a so-called "wide film" is fittingly projected on a screen of say 40 feet width, the minimum comfortable viewing distance is 40 feet, if effortless scanning is upheld. Such minimum distance excludes a number of seat-rows, which must be filled, to maintain normal box office returns.

What are now the sense reactions upon patrons sitting closer than at a 40 foot distance?

### Close Viewing Harmful

To visually quickly cover the whole expanse of the picture such closer distances calls for unusual efforts of the eye or even neck muscles, with resultant strain and discomfort. Furthermore, when details towards the edge of the picture are viewed at an angle of less than 60 degrees, the distortion of these details becomes increasingly apparent, and a decidedly unnatural effect is produced, thereby destroying the inherent beauty of the composition.

Viewing, however, such a wide picture from the minimum distance of 40 feet enhances its beauty over that of a narrower picture for several reasons. Leaving aside the greater latitude of possibilities for composition, more closely approaching natural vision, a decided factor for three-dimensional effect is established by the following reason: If the eyes wander from central viewing distance of 40 feet towards the edges of the picture, the viewing distance increases up to 44 feet. To keep the eyes properly focused, the accommodation muscles come involuntarily into play

to flatten the crystal lens of the eyes; the angle of convergence is also automatically changed.

Both of these automatic muscle activities, and they *alone*, produce our sensory impression of depth, when we look at reality. Similar sensory reactions take place, when accommodation and convergence change while looking at different parts of a picture far enough from each other to make such reactions perceptible.

### Pseudo "Depth" Effect

We receive, therefore, a decided three-dimensional illusion or depth impression, when we look at a wide screen picture from a proper distance. Emphasis should be given to the fact that this three-dimensional illusion as an attribute to "wide screen" pictures, has no foundation in or connection with the size or the width of the film, or the optical system producing pictures thereon, or the optical characteristics of the projection system.

In connection with this analysis of natural human vision, one of its most interesting characteristics from a photographic point of view—its depth perception—the reason for same, and the possibilities of similar screen illusions as above touched upon, had to be closely analyzed and studied.

In the art of stereoscopy, which attempts to produce depth effects in a complex photographic way and by special viewing apparatus, similar sense reactions, as those produced by the eyes when they look at three-dimensional reality take place, and thereby certain pleasing effects have been achieved in still photography. These come, however, more into a class of photographs which we might call unusual effects rather than sound approach to natural vision.

Even Helmholtz states in his "Antagonism of Visual Fields" that the total perception of two visual fields, which is required for vision through a stereoscope, is not a normal physical phenomenon.

### Improved Technicolor Product At Much Lower Cost

The Technicolor Corporation, which makes color film for most of the producers, has announced a new product. As the result of several years of research work, Technicolor is bringing out an improved print which possesses a combination of qualities never before achieved in color photography—brilliance, smoothness, and freedom from grain. In this new product, Technicolor makes another notable contribution to the improvement of motion pictures.

Along with this announcement of improved quality comes the news of equal importance to the film industry that the price of Technicolor prints has been materially reduced, effective May 1. The new price will be seven cents per foot, net, on all orders of



twenty or more complete Technicolor release prints from one negative where such orders are accompanied by cash in the amount of half the estimated cost of such prints.

This move, which is in conformance with the Technicolor policy of co-operating with the producers and distributors, will unquestionably result in an increased number of color pictures during the next year.

### Waxing Prints Properly

Some film processing concerns so treat the prints that there is absolutely no trouble with film sticking or collecting on the tension shoes during the first couple of runs. But some prints seem to be coated with a substance that causes trouble for the projectionist.

The result is that tension shoes, sprockets and even the sound slit is filled with what seems to be a brown floor wax. During the first two or three runnings, especially with high intensity lamps, this substance melts off and collects on the first cool surface it comes in contact with.

The result: one side of the intermittent sprocket piles up with wax until the tooth will hardly enter the sprocket hole and a wobbly picture on the screen is the result.

The application of this stuff is seldom equally applied and as a rule only one side of the sprocket is affected. After the sprocket has all it will hold the rest passes down to the take up sprocket and it fills up in turn, following which the slit in the sound gate gets a share with fatal results to the volume and quality of the sound.

The use of ordinary waxes of this kind for this purpose constitutes a fire hazard for, if the intermittent tooth fails to engage because of this clogging, the film is liable to stop in front of the aperture. Then, fireworks with the amperage we carry today.

Get yourself a good stiff tooth-brush and keep it on the starting box where it is easy to grab when you see the sprocket turn dark between the teeth. It will save you trouble.

### Use 'Flying Spot' Method of Scanning in Television Work

THE "flying spot" method of scanning or analyzing the subject is employed in the Jenkins Television Studio, recently opened in New York. The subject faces a sweeping beam of light cast by a powerful projector placed in a small room directly off the main studio. The projector is mounted on an adjustable stand so that the beam may be readily shifted to cover any portion of the studio where the subject performs. Also, the projector is provided with several lenses of different focal lengths, so as to focus the spot of light and

the field of vision for close-ups, half-lengths or long shots, thereby providing a variety of pictorial effects similar to those of motion picture technique, without changing the relative positions of performers or equipment. The scanning system is of the 60-line, 20-pictures per-second category. This means that the subject is swept in sixty horizontal lines from top to bottom for a single picture, at the rate of 20 pictures per second.

The reflection of the scanning beam by the subject is intercepted by a pair of photo-electric cell units, or "electric eyes," placed in front and to either side of the subject. These cells convert the varying pictorial value into electrical terms which, vastly amplified, are sent to the transmitter to be impressed on the outgoing television waves.

At the home end, the television signals are received by a special television receiver, greatly amplified, and fed to a radiovisor or picture reproducing device. The radiovisor must provide a corresponding spot of light as that reflected by the subject at the studio, in perfect step or synchronism with the studio scanner. This is done automatically by the latest television equipment developed by the Jenkins organization in collaboration with the De Forest Radio Company, both of Passaic, N. J.

The subject faces the microphone as well as the scanning projector. The microphone picks up the voice or music which, converted into electrical values and greatly amplified, is impressed on the outgoing waves of the WGBS transmitter several miles' distant. At the home end the usual broadcast receiver is tuned to 254 meters, bringing in the usual sound program of Station WGBS, which, when the stations are operating together, serves as the sound accompaniment for the television program.

At other times the television studios make use of standard motion picture film, which is run through a special form of pick-up apparatus so that every inch of the film is scanned and translated into electrical terms by a photo-electric cell. The films may be silent or accompanied by regular sound recordings, as desired or necessary.

### Extreme Precision Necessary in Manufacturing Microphones

An amazing example of precision in manufacturing is illustrated in the new type microphone manufactured for sound picture apparatus and radio broadcasting. The condenser type microphone was developed to provide the most sensitive and faithful method of picking up all kinds of sound ranging from the highest soprano notes to the low boom of a bass drum, and to reproduce them with utmost fidelity.

Each transmitter must pass 46 mechanical and electrical inspections before being accepted as a finished product. The insulation, for example, must show a resistance of at least 80,000,000,000 ohms, the natural frequency of the diaphragm is required to be between 5,000 and 5,050 cycles a second and the back plate of the condenser must be within .00008 inches of a true plane. The test which determines the last factor is made by utilizing certain laws of physics regarding the interference of light waves.

The assembly and inspection of the microphone is done in an air conditioned room which is supplied with air at a constant temperature of 70 degrees Fahrenheit and a constant humidity of less than 40 per cent. Between operations all piece parts are kept in jars in which a supply of calcium chloride absorbs all moisture. The intricate assembly operations are carried out in dustproof boxes under a low power binocular microscope which magnifies the object being assembled to 16 times its actual size.

In the first assembly operation a duralumin diaphragms only a thousandth of an inch thick is mounted in a shell with a ring which can be adjusted to stretch the diaphragm. An oscillograph is used to determine that the diaphragm has been stretched so that its natural frequency is between 5,000 and 5,050 cycles per second.

The diaphragm and the back plate, which as already mentioned, is lapped to within .00008 inches of a true plane, are then thoroughly cleaned under a microscope. A duralumin spacer of from .001 to .0012 inches, placed between the back plate and the diaphragm, insures the proper capacity of the condenser. This assembly is then sealed with hot wax. The condenser is sealed off from the outside air by means of a thin membrane, the air is exhausted with a vacuum pump, and the space is filled with nitrogen. This prevents any change in atmospheric pressure from affecting the capacity of the condenser.

Following the final operation a number of exacting tests are given to the transmitter to insure its proper performance under all conditions.

### Exciter Lamp Current Valves

At three per cent reduction in current below the rated value practically doubles the life of the lamp, but its light output is reduced by twenty per cent. It has been more or less general practice to operate these lamps at current values below that at which they were designed to operate. But when the expense of changing lamps more frequently is weighed against sound quality, it will be found that true economy dictates running the exciter lamp, the veritable dynamo of the sound reproducing system, at its full current value.



# Novel Projector Reduces Film Injury

The projectors described in the accompanying article feature a design which is intended primarily to reduce greatly the injury which is now done to the films during projection in non-continuous projectors. This article appeared originally in the French paper *Le Cinephose*, Vol. XII, November, 1930, translation and abridgement from which was made for the S.M.P.E. for May, 1931, by A. G. Denis of the Eastman Kodak Co.

IN this paper are described by "Codus" two motion picture projectors designed and marketed in Europe by M. Oehmichen. The characteristic features of their design are intended to reduce the effects of wear and injury to the film as much as is possible in a non-continuous projector. Worn and torn sprocket holes, after a few hundred projections in the conventional type of projector, result in the screen image becoming too "jumpy" for continued use of the film. The designer attributes this mainly to the excessive pull exerted upon the edges of the film perforations by the sprocket drive. The pull is exerted at two places: First, the feed sprocket pulls the film out of the supply reel, against the heavy friction applied to prevent uncontrolled unwinding of this reel, and the strain of this pull is exerted upon the perforation edges at the feed sprocket. Second, the friction drive of the take-up reel exerts a similar pull upon the film which is resisted by the take-up sprockets, and the strain of this pull is similarly exerted upon the perforation edges at the take-up sprocket. The tension applied results in both cases in a tearing effect upon the perforation edges when the films is either forced down upon the sprocket teeth or pulled away from them.

The action of the pull-down claws is similarly exerted upon the perforation edges. However, "Codus" indicates that the designer of the Oehmichen projectors does not consider the action of the pull-down claws as one of the primary causes of wear, and,

if his theory may be considered as correct, the action of the pull-down claws is not resisted by a heavy pull like that of the driving sprockets but is resisted only by the friction applied at the gate. Furthermore, although the Oehmichen machines embody every feature calculated to reduce to a minimum any wear of the film which may be due to the action of the pull-down claws—multiple claws, a special gate of patented design, independent pressure pads, and a very low pressure of 3 ounces—the Oehmichen gate and pull-down mechanism present no feature constituting a radical departure in design, as do the feed and take-up sprockets.

## New Roller Arrangement

On one type of the Oehmichen projector (Type GC4), there are provided feed and take-up sprockets of conventional design whose action is supplemented by that of driven friction rollers. The function of these rollers is not to drive the film positively but solely to take up, in a manner which cannot result in injury to the film, the strains required to pull the film from the supply reel and to resist the pull of the take-up reel. This avoids putting heavy strains upon the perforation edges at the sprockets themselves and the film enters and leaves the sprockets without appreciable injury.

The friction rollers are cylindrical drums of the same width as the film, covered with rubber on their edges. The perforated edges of the film are in contact with a rubber surface on both sides and the picture area of the film does not come into contact with the surface of the rollers. It will be seen by referring to Fig. 1, which illustrates in schematic manner the Oehmichen Type GC4 projector, that no pressure rollers are used to maintain the edges of the film in contact with the friction rollers, but that the film is merely looped around the greater part of the periphery of the friction rollers by means of standard

guiding rollers. As a matter of fact, no continuous positive contact such as would allow no slippage is sought between the film and the friction roller.

The friction roller intended to supplement the action of the feed sprocket revolves at a peripheral speed slightly higher than that of the feed sprocket itself, and the friction roller used in conjunction with the take-up sprocket revolves at a peripheral speed slightly lower than that of the latter. It will be obvious that if continuous positive contact were established between the friction rollers and the film, loops would at once form between the friction rollers and the sprockets with which they are associated.

However, since there is no mechanism provided to maintain continuous positive contact between film and friction rollers, and since a heavy pull is exerted by the film in the case of both friction rollers on the side away from their associated driving sprockets, no such loops can actually be formed. This is due to the fact that any slackness of the film between the driving sprocket and the friction roller must manifestly, long before a loop can be formed, cause the loss of positive contact between film and friction roller and must result in slippage.

## Film Slippage Factor

The greater or lesser degree of slackness of the film between friction roller and driving sprocket must provide a continuous and instantaneous regulation of slippage on the friction roller. This slippage decreases, and a positive contact may even be established momentarily whenever an appreciable tension of the film happens to develop between the friction roller and the driving sprocket. The slippage increases rapidly as soon as a certain degree of slackness of the film between friction roller and driving sprocket has been exceeded.

That the friction roller can effectively be made to assume the pulling strains exerted by the film and relieve the driving sprockets of all but a negligible fraction of this strain, will become apparent when it is realized that the mechanism constitutes an ingenious and simple application of a familiar principle in the operation of the capstan. It is well known that if a belt be looped around a rotating shaft, the continuous pull which it is required to maintain on the outgoing side of the belt in order to prevent slippage and maintain positive contact between the belt and the shaft is only a fraction of the pull which it is desired to exert on the ingoing side of the belt. This fraction, which is a

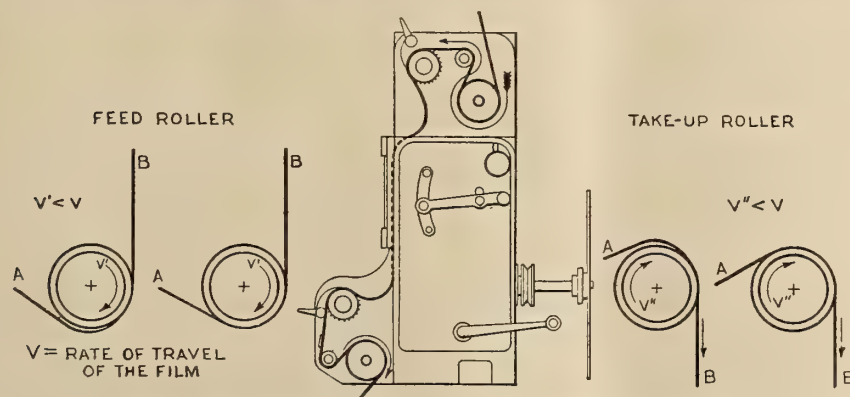


Fig. 1. Schematic arrangement of Type GC4 projector



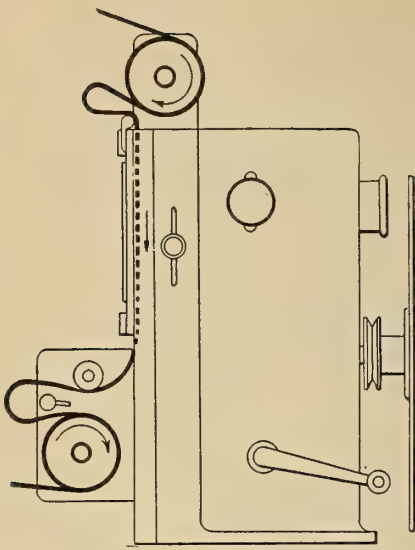


Fig. 2. Schematic arrangement of Type BAG projector

function of the area of contact, the ratio of the latter to total peripheric area of the shaft, and the coefficient of friction may easily be made small. Moreover, the ratio of the pull transmitted by the shaft to the pull applied to maintain contact of the belt increases rapidly with the latter.

In the case of film which is looped around a well-designed friction roller, a pull of a small fraction of an ounce exerted on the film on the outgoing side of the friction roller is sufficient to permit the latter to transmit a pull of several pounds to the film on the other side of the friction roller.

The friction roller thus does not relieve the driving sprocket—and the perforation edges—of all pulling strain, but limits the pull on the perforation edges to the tension required to maintain slipping contact between film and friction roller. In other words, it limits the pull to a negligible fraction of its normal value.

The same explanation applies as well to the action of the friction roller associated with the take-up sprocket, which revolves more slowly than the latter and resists a pull instead of applying one, as to the action of the friction roller associated with the feed sprocket.

#### The Recent Type BAG

On a more recent type of Oehmichen projector, Type BAG, a much more radical departure from conventional design is attempted. The BAG projector appears to have been designed primarily for use in schools or by amateurs, and it would seem legitimate to claim for it the advantages of great simplicity and cheapness of construction as well as those of the reduction of film wear. It has a pull-down mechanism with self-engaging claws which presumably does not differ much from that of its predecessor. It contains no sprocket at all, and has no positive drive. Friction rollers with automatically-regulated slippage

take the place of both feed and take-up sprockets.

As in the case of the GC4 projector, the speed of rotation of the feed friction roller is so adjusted that it tends to pull the film out of the supply reel and feed it to the pull-down mechanism faster than the latter requires. The take-up friction roller revolves at such a speed that, allowing no slippage, it would feed film to the take-up reel more slowly than it receives it from the pull-down mechanism. A certain amount of slippage is thus necessary to prevent the formation of loops of unreasonable size.

Since there are no driving sprockets of which the positive drive can be used, as in the case of the GC 4 machine, their regulated pull cannot be used to control the degree of contact between film and friction roller and thus regulate their slippage. Moreover, the pull exerted by the pull-down mechanism is obviously too abrupt to permit its use to regulate slippage directly. As a matter of fact, loops of a certain size must be maintained both above and below the pull-down mechanism to permit the smooth operation of the latter.

Fig. 2 shows schematically how the problem of maintaining these necessary loops and simultaneously utilizing the pull of the pull-down mechanism to control slippage has been ingeniously solved. Between the pull-down mechanism and both the feed and take-up rollers, the film is passed back and forth between the friction roller and a guide roller placed in close proximity to the friction roller. On both sides of the pull-down mechanism loops are thus formed which permits smooth and effortless operation.

#### Effective Slippage Control

It would seem, however, that since no pull is applied on the film at the points where it leaves the friction rollers to form these loops, there would be nothing to check slippage once the projector is put in operation and that these loops could not be maintained. Such, however, is not

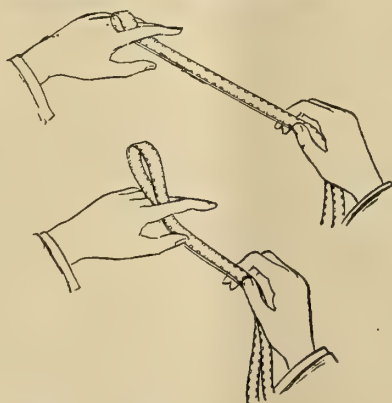


Fig. 3. Illustrating the principle by means of which the loop is maintained in the projector; due to the pressure exerted by the loop it is difficult to pull it through the fingers

the case. In order that the loop should be lost, it would have to be reduced to a very small size in order to slip out between the friction roller and the guiding roller. A very simple experiment, illustrated in Fig. 3, which consists of attempting to slip a loop of film from between two fingers held almost in contact, will show at once that this cannot be done easily. The film resists bending at a sharp angle, and the two sides of the loop begin to exert a very appreciable pressure on the fingers as soon as the radius of curvature of the loop falls to certain limits.

In the same way, as soon as the action of the pull-down mechanism, or that of the take-up reel, have reduced the size of the upper and lower loops to a certain radius of curvature which is a function of the thickness and elasticity of the film, but apparently never falls below safe limits, an appreciable pressure is exerted by the film against the friction roller. This pressure, increasing the adherence of the film to the friction roller, is identical in its effects to the steady pull of the driving sprockets in the GC4 projector. It permits the friction roller to transmit to the film a steady pull which is out of proportion to the pressure exerted by the loop. In other words, the loop adjusts its own size by controlling the slippage.

It is asserted that this automatic regulation of the size of the loop is a further great advantage of this projector and greatly tends to make its threading fool-proof and increase the reliability of its performance. No care whatever need be taken to adjust the size of the loops before starting since they automatically adjust themselves within a few revolutions of the machine. Many irregularities and faults in the film, the occurrence of which would result in disastrous damage to the film in the ordinary projector, cause in the sprocketless projector only a momentary disturbance followed instantaneously by a return to normal operation.

It is claimed for both the GC4 and the BAG projectors that they may safely be run at speeds as high as 180 feet per minute, and that, by renewing splices after every thousand projections, it is possible to project the same film 30,000 or 40,000 consecutive times without producing more than a normal amount of wear on the film.

#### Proper S. R. P. Markings

Any information the individual may wish to furnish the projectionist should be printed in black letters on a white background in the 32 frames immediately following the Part Title in the Identification Leader of the Standard Release Print. This information may also be placed in the 32 frames immediately following the End-of-Part Title in the Identification Trailer.



## Letters to the Editor

### Remote Volume Control

EDITORIAL comment anent "Proper Volume Control" in the April issue prompted the following contribution from an English friend—a contribution which serves incidentally to deflate our ego a bit and to demonstrate anew that we here in America might with profit keep our eye on sound picture developments in England and on the Continent. This letter, signed by F. A. Cam, a director of Sound, Ltd., follows:

Sir: With reference to your article entitled "Proper Volume Control" in your April issue, we note with surprise that you apparently look upon an outside (the projection room), volume control in a theatre as something of a rarity. We have for the past five years fitted outside volume controls in all our installations, the earlier installations being, of course, only for the accompaniment of silent films by non-synchronous disc recorded music.

We agree absolutely with your opinion that volume control is not a part of the Projectionist's duties, and we may say from our experience that we have always found Projectionists only too glad to be relieved of this extra task. Your concluding sentence, "If a satisfactory remote control device is available, by all means let us have it as quickly as possible", also surprises us, as it is comparatively a simple matter to install a volume control which can be operated at any reasonable distance from the amplifier without introducing distortion, the relative amplitude of various frequencies remaining unchanged for any setting of the control.

The method we employ usually is to shunt the primary winding of the first inter-valve transformer in the main amplifier with a variable resistance of approximately 50,000 ohms. This resistance is not connected directly to the transformer but is isolated from the D.C. component by a large capacity condenser in series with each lead. As is well known, the shunting of the primary of a transformer by a resistance tends, if anything, to improve the characteristics, and we have found that this form of volume control gives most satisfactory results. Owing to the fact that no D.C. current passes through the resistance, the Graphite Type, such as the "Centralab", can be used, and it gives extremely smooth variation.

### More Data on the S.R.P.

Tabulation of the returns from the survey on the Standard Release Print among projectionists throughout this country and in Canada is now in progress by the committee appointed to supervise this work. It is definitely understood that there will be some minor changes made in the S.R.P., after which will come the task of closely supervising the inspection work of the various exchanges, by the producer representatives, and the checking-up of work in the individual projection rooms, by the Projection Advisory Council agents in the various key cities.

Although the survey is now complete, projectionists continue to express themselves on this important phase of theatre reproduction work. Several of the more interesting of these contributions are presented here:

We have just received a letter from the Metro exchange stating that we have committed a crime in doubling-up their prints. We believe the crime is theirs in sending us

reels in short lengths. There is more than one angle to this business. The faction favoring 1,000-foot reels (which, incidentally, average about 800 feet), is comprised mainly of exchanges who don't want to spend a cent in rearranging their shipping, inspection, and storing routine. A short time ago the trouble was combination prints; now along comes the S.R.P.—and all the troubles are expected to be ironed out in the projection room. The remedy does not lie with the projectionist.

We projectionists have ample reason to believe that the other branches of the industry know very little about projection and appreciate none of our problems. We have S.R. prints with 11, 11½, and 13 feet of blank leader (numbered to 12, of course); the dots are spaced incorrectly and positioned wrong; on one reel of "Charlie Chan Carries On" the dots were on the left side. Fox is a flagrant offender in the matter of printing the reel number in the sound track a few inches from the first picture. Fox also carries the talk record too far on the end of the reels, sometimes giving less than the minimum 15½ inches (we wonder if the Roxy Theatre tolerates this?).

The S.R.P. is a fine idea, but it is absolutely worthless if it is not kept standard. When are we going to get film in 2,000-foot lengths; and who among the executives of this business is big enough to grasp this problem in all its ramifications?

J. K.

From Edward C. Smith, Post Exchange, Fort McDowell, California, comes this reflection on those of us who don't know a good thing when we see it:

For several months now I have been reading the opinions of projectionists in all sections of the country on the S.R.P. All I can say is that some people don't know when they get something good. I think the few black dots look a darn sight better than a lot of scratches and punch holes, and the S.R.P. certainly is a grand "lift" for the one-day runs.

An indication of a group of projectionists who believe in doing more than just talking about the S.R.P. is had in the following communication from A. H. Estes of Columbia, S. C., who sends in a sample sticker which is pasted on every film can sent out in his district—the work of that very progressive projectionist organization, the South Carolina State Council:

I am sending along herewith a couple items which may be of interest to your readers. Practically every theatre in the jurisdiction of this L.U. (347, Columbia, S. C.), is now receiving S.R. prints. This L.U. has notified every theatre in its territory that the hooking-up of prints must stop, and the local Film

### Notice!

To all projectionists in the jurisdiction of Local 347, I.A.T.S.E. & M.P.M.O. Union, Columbia, S. C.

This is to notify you that there will be no doubling-up of any print over one (1) reel on 2,000-ft. reels regardless of whether the print has been cut before you receive it or not. All pictures must be run on the regular 1,000-ft. reels during your run.

Should you receive a print that has been already cut, please report same to your theatre manager.

A fine of \$10.00 will be placed on the shift that cuts any picture in order to double-up same on 2,000-ft. reels.

Please abide by the above and let us have your full cooperation in this matter.

Local 347, I.A.T.S.E.  
& M.P.M.O. Union,  
Secretary.

Board of Trade is cooperating with us on this. The other item is a sticker that is placed on the lid of every film container which is shipped out of theatres in Charleston, Columbia, Greenville, and Spartanburg, calling attention to the fact that a little cooperation on the part of all projectionists will give the paying public a much better show and will aid the men who handle the prints after the first-run.

R. G. Blake, projectionist at the Star Theatre, Bar Harbor, Maine, registers the following opinion:

I think the 12-foot leader at the beginning of each reel is just right. The visible numbers on this leader are a great help. The "Start" motor cue and "Change-over" cues seem to fit the W.E. system nicely. I mean the distance between cues is just right to give the incoming machine just enough time to get up to speed. (Ed. Note: This may not hold true for all W.E. equipment, due to the difference in motor pick-up.) I think that if the C.O. dots were almost at the bottom of the scene instead of at the top they would be less noticeable to the audience, but would be just as good for the projectionist. Three dots would be enough, and they could be one-third smaller than at present. Placing the dots in the extreme lower right corner is my suggestion for improvement.

An "international change-over" is the term employed by Wilfred Spicer of Saskatoon, Canada, in describing his suggested improvement:

My idea on an international change-over is as follows: 1. The dots to be in the upper right corner, either 4 or 6 of them placed one or two frames apart and 15 feet from the

### BROTHER PROJECTIONISTS

Let's all get together and see if we can't keep the Prints of the Pictures that we use in good condition. We all know that a Print leaves the Exchange for its first showing in a good condition. We know it can't stay new, but we can keep it in good condition.

LET'S —Keep our Projectors in first class condition.

LET'S —Inspect the Prints—Make good splices using good fresh cement.

LET'S NOT—Punch holes—Scratch—Put paper—or mark the end of a part.

LET'S NOT—Join subjects or parts of a picture together.

LET'S —All help ourselves by helping others, it will mean Safety—Service—and Better Projection.

South Carolina State Council.



end of the scene. 2. All sound to fade-out about 9 feet from the S.M. marks. 3. Same scene sequence on both outgoing and incoming reels. On incoming reels the sound to fade-in about 2 feet from the start of the picture. 4. On incoming reels, 15 feet of film from the start mark to start of picture. All change-overs to be made at speed, to allow for equipments having either a fast or slow pick-up. The former can always run down sufficiently to take care of the extra film required for the slower pick-up.

### Care of Commutators

Loose commutator bars (high or low), can sometimes be tightened by screwing up the commutator nut or by tightening the bolt or set screws, if they are used. If this is not sufficient the commutator must be removed from the armature and tightened in a press. This involves the disconnection and reconnection of the armature leads and it is recommended that such work be done where proper tools are located.

Pitted mica segments should be repaired as soon as discovered. Clean the hole thoroughly and fill it with an insulating paste that will quickly harden and that will hold its position when the commutator is warm. Two mixtures which have been used successfully are prepared chalk or plaster of paris and shellac or water glass and powdered glass.

Excessive unexplained heating of a worn commutator while carrying normal load or less indicates that it is worn-out and should be replaced by a new one.

The thickness of a motor brush has an important bearing on commutation. In a direct current machine the direction of a current in a coil must reverse while the commutator bars connected to that coil are passing under the brush, or, in the usual terms, while the coil is short-circuited by the brush.

In a perfectly designed machine the coil undergoing commutation is in a field just strong enough to reduce the current to zero and build up to full value in the opposite direction. If the current does not reverse and build to full value the coil is said to under-commutate. In either case sparking may result from under or over-commutation. Sparking from over-commutation is generally severe.

### A Continuous-Film Camera For the Oscillograph

An oscillograph, as the name implies, is a device which enables one to observe the waveform of an electrical current and to note any changes in this waveform with the passage of time. Some interesting data anent this device was published recently by the General Radio Co. This is accomplished by converting the varying electrical current into mechanical vibrations which are a more or less perfect reproduction of the variations in the amplitude of cur-

rent. A spot of light reflected from such a vibrating system, or the shadow of some portion of the system itself, focused to a point, will vibrate back and forth and will, accordingly, trace a straight line upon a viewing screen. The length of this line will be proportional to the amplitude of vibration but no indication of the waveform will appear on the viewing screen because the coordinate of time is lacking.

There are two methods whereby a proper time element, perpendicular to the direction of vibration, may be introduced. One of these consists of causing the vibrating shadow or spot of light to be reflected, before striking the viewing screen, from a single- or multiple-sided plane mirror which is rotating about an axis parallel to the line of vibration of the spot. The shadow spot or light spot will then be given an additional displacement, proportional to time, at right angles to its vibration due to the amplitude variations in the electrical current, so that a waveform, that is, a trace showing the relation of amplitude and time, will appear on the viewing screen.

If the current waveform is a repeated and sustained one, and if the rotation of the mirror is synchronized at a proper speed, a stationery trace will appear on the screen. This method is used in the General Radio Type 338-L String Oscillograph and in all other forms of oscillograph making use of the rotating-mirror principle. In the above mentioned type oscillograph the vibrating element consists of a single fine tungsten filament passing through a magnetic field supplied by a permanent magnet. The shadow image of the center portion of this string is thrown into the rotating-mirror viewing box or into the camera.

If the screen upon which the vibrating line is traced is capable of retaining an instantaneous picture of the shadow spot or light spot—that is, if it is of the nature of a photographic film—then the second method of introducing the time axis may be employed. This consists merely of pulling along the screen continuously in a direction perpendicular to the line of vibration, thereby giving the required trace of amplitude versus time.

### Hints on Motor Drives

The connection between the driven machine and the motor depends upon many factors, but often the success of the installation hinges upon the method of drive. In every case the problem should be given careful consideration.

Belts are the most common means of driving machinery and are usually the cheapest. Belts have the disadvantage of being elastic and stretching which causes slipping. Slipping means lost power and often re-

duced production on the driven machine. The fact that belts will slip is sometimes an advantage however. Belts will sometimes cause trouble by coming off under jerky loads and they are not desirable for use at high speeds. Idler pulleys and belt-wrap-pers can be used where the pulleys are close together, of greatly differing size, or to take up the slack.

Chain belts are positive, and are useful for short-center drives. They will not slip. Sometimes they are noisy and some require considerable lubrication. Chain belts are very popular. For great speed changes, high speeds and close quarters, gearing is generally desirable. This requires rather rigid supports for motor and driven machines and fairly accurate alignments.

Direct drive through a flexible coupling makes the neatest and simplest installation where the motor speed is the same as that of the driven machine. Often it requires careful aligning, however. For high speeds, direct drives are almost universal. Speed reducers, rope drives, clutches and combination drives find application on special installations.

In planning a motor drive, the speed of the motor should be considered. Always remember that the slower the speed of the motor the larger it will be and the more expensive. Often a high speed motor can be geared down more cheaply than a low speed motor can be installed to drive directly.

### Spanish Sound-Film Projector

Carlos Mendizabel Brunet, of Palo (Malago), Spain, has invented and exhibited before engineers of the School of Mines in Madrid a film projector called the "Kinisophote," according to Commercial Attache Charles A. Livengood, stationed at Madrid, in a report to the U. S. Department of Commerce.

This machine runs continuously, at a constant speed, as its name implies, and the screen receives a constant amount of light, thus doing away with flickering. It suppresses the Maltese cross and allows the use of very thin (cellophane), film, driven by only one side of the film being perforated. The sound groove is placed in a 5-millimeter space, so that the section for pictures retains its normal one-inch width without narrowing. The film is driven at a constant speed at every point, so that the sound impression can be taken up anywhere. Instead of being 75 holes distant from the corresponding figures, it can be placed immediately opposite them, thus avoiding the difficulties arising from cuts and repairs. Finally, after being wound up as usual during projection, the film is not re-wound, but is picked out from the inside of the reel to be projected again. This operation is done by conical rollers. Patent rights have been obtained or solicited in the principal nations.



## Everyday Science

### Get New 'Intermediate' Waves From Electrified Alum

New invisible rays which are neither X-rays nor rays of ultra-violet radiation but which resemble both of these have been investigated by Dr. Isay A. Balinkin, of the University of Cincinnati, who describes in the British scientific periodical, the *Philosophical Magazine*, a new generator for these almost unknown rays.

This generator consists of a small pellet of powdered alum, compressed into nearly solid form like a medicinal tablet. To this pellet Dr. Balinkin applies a large electric voltage. When an ordinary photographic film is placed close to such an electrified pellet an impression is produced on the film, like the effect of light rays or of X-rays. A very thin sheet of celluloid or similar material, like some of the transparent paper-like materials now used to wrap candies or tobacco, is enough to stop these new rays although X-rays would go through such materials as though they were not there.

#### Classified as Intermediate Waves

From this characteristic of easy absorption and from other characteristics, Dr. Balinkin deduces that the alum rays belong to the ordinary "ether wave" series together with light, ultraviolet rays and X-rays, and that they are intermediate in wavelength between ultraviolet rays and X-rays. Just as X-rays themselves were long unknown, so almost nothing is known about the new intermediate rays except the fact of their existence.

Now that Dr. Balinkin's pellets of compressed alum are available as generators the properties and perhaps the utilities of these rays may be expected to be investigated more actively.

### Investigate Twin Atoms as Clue to Artificial Life

That the chemistry of life may depend on a mysterious power of living matter to select the special kinds of atoms called isotopes and that this is the real reason why chemists always have failed to create life artificially, was suggested recently to the French Academy of Sciences, in Paris, by the Russian biochemist, M. W. Vernadsky.

Many elements, like the element potassium, known to be important in the structure of living matter, are known to exist, M. Vernadsky recalled, in two or more atomic forms, precisely alike in chemical properties but differing in the structures of the centers

of their atoms as well as in the weights of these tiny ultimate particles. These are called isotopes. No chemical method will separate them but by delicate experiments involving enormous magnetic forces, Dr. F. W. Aston, of Cambridge University, England, has been able to identify a number of these "twin elements."

It is possible that many mysteries of the chemistry of life might be explained, M. Vernadsky now suggests, if all germs of living matter are able somehow to distinguish between the different isotopes; selecting for building into a living body, for example, only one of the kinds of potassium atoms to the exclusion of other kinds. Since chemists always work with mixtures of atoms including all of the isotopes it would not be surprising, if this idea is true, that life has not yet been created artificially.

### "De-Ion" Lightning Protector

Engineers recently shot enough electricity through an experimental lightning-rod to lift the Woolworth Building off its feet. The giant "spark plug" at the new Westinghouse high-power laboratory blazed into action for the first time as over 132 million volt-amperes leaped across the terminals to the lightning-rod on test. There was a burst of flame from each end of the rod and the report of a six-inch cannon as the experimental lightning-rod "knocked out" the terrific lightning bolt in less than 1/500 of a second.

"The results of the tests are so promising," said J. J. Torok, Westinghouse lightning wizard and inventor of the rod, "that we are working night and day to finish its development as rapidly as possible. We hope it will effect greater economies in present forms of flashover protective devices now in service to protect insulator strings on overhead transmission lines which supply cities with light and power. In addition, it is expected to provide permanent protection against the ravages of lightning and save the country millions of dollars a year.

"Now, after a lightning stroke, protective devices of the fuse type must be replaced. This requires constant patrolling of the lines. Because of the limitations of a single line, duplicate lines must be constructed. The new lightning-rod does away with this expense."

Its construction is simple. It consists of a hollow tube about the size of a lady's umbrella. A piece of metal at each end serves as an elec-

trode to entice the lightning inside for the "knock-out" blow. It is supposed to work so fast that the lights in a house will not even flicker. This device, technically known as a "De-Ion" lightning protector, is used to protect insulator strings on transmission lines against flashover. Engineers have estimated that if the Torok lightning-rod is successful and had been available ten years ago, the world would have saved a hundred million dollars.

### New 'Stratosphere Airplane' Nears Completion in Germany

An airplane with body, wings, motor and propeller designed for very thin air and with an airtight cabin in which the pilot and passengers can live comfortably even at heights of 10 miles or more, is being built by the Junkers works in Germany in an effort to break the height record both for balloons and for airplanes and with the hope that the atmospheric levels called the stratosphere, seven to twenty miles above the ground, may be opened to high-speed and long-distance flying.

The machine weighs about four and one-half tons, has a single motor and is equipped with air compressors of novel design both to provide the engine with necessary oxygen and to pump compressed air into the cabin so that the passengers can breathe. The gas masks and oxygen apparatus now used in high flying will be unnecessary, although these may be carried for emergency purposes in case the airtight cabin springs a leak.

#### Hope For 20-Mile "Ceiling"

The levels, shafts and wires necessary to control the airplane will be taken in and out of the cabin through airtight joints.

The first machine, now being completed at the factory near Dessau, is not designed for distant flying nor for especially high speeds, but will be used chiefly to accumulate practical experience in high flights near the home airport. If this machine succeeds others will be built for still higher flying levels and for longer flights, using experience obtained with the first one. Enthusiasts hope that the idea ultimately will permit flying at 15 or 20 miles above the ground and at speeds making possible a transatlantic trip in three or four hours.

### Electricians in Heaven

Heavenly electricians, who put the stars in place and replace those that have burned out are reported by the *Roanoke News*. This startling discov-



ery was made in the American Theatre of that city where a starry dome is located in the roof, for audiences to gaze at and wonder how anyone could replace the electric lights. Much too high to reach and a ladder would be very insecure and hard to put in place every time a bulb burned out.

But the electrical boys don't float on angel wings—yet. They do the business from little alcoves set around the walls, with a "mechanical hand." The mechanical hand is a long pole with a wire running down it. At the business end is a hand, made of wire covered with rubber to prevent slipping. The person operating it lifts the pole, puts the hand over a light bulb and pulls on the wire at his end of the pole. The hand tightens and the pole is twisted—and out comes the bulb.

### Modern Refrigeration Checks Enormous Bacteria Growth

According to the Bureau of Home Economics of the U. S. Department of Agriculture, cold efficiently checks bacterial growth in food. This emphasized the importance of proper refrigeration, and in this field both the electrical and gas refrigerators for domestic use fill a long-felt need which other types of refrigeration cannot meet.

To emphasize the importance of refrigeration in the keeping of food, specific tests on bacterial increase in milk showed that taking fresh milk with a bacterial count of 2,300, milk held at a temperature of 40 degrees showed an increase to 9,000 at the end of 24 hours, 15,000 in 48 hours, 23,000 in 72 hours, and 34,000 in 96 hours. Where the temperature was maintained at 50 degrees the increase at the end of the first 24 hours was 30,000 greater, and at the end of 48 hours it was 56,000 greater. At 60 degrees the bacterial content the first 24 hours increased 110,000, but at the end of 72 hours it reached the enormous figure of 3,100,000.

#### 50° the Danger Line

Fifty degrees is considered the danger line in the preservation of food in refrigerators, while 40 degrees will keep food without spoiling for a long length of time. These tests of the Department of Agriculture indicate that the increase for every five degrees above 50 degrees is very rapid.

### Forest Cleared to Build Transmission Line

In the construction of New England's first 22,000-volt electric transmission line from Fifteen Mile Falls, in New Hampshire, to Tewksbury, Mass., it was necessary to cut down and dispose of a forest of very sizeable dimensions.

This transmission line is constructed over a right-of-way 350 feet wide and 126 miles long. The right-of-way

covers a total area of 5,345 acres, and one of the astonishing things to those who profess to believe that New England is largely denuded of her forests is that only 600 acres of this total were open country and 100 acres of these 600 were on highways and rivers.

It was necessary to clear this entire 126 miles of right-of-way of all trees and underbrush. All marketable timber was cut into 12 and 16 foot logs and disposed of. The brush was cut and piled in three rows, the outer rows being about 50 feet from the edge and about 85 feet from the center of the way. As soon as this material was dry, it was burned whenever conditions were favorable.

To clear this area, a force of about 300 men have been constantly employed since January 1, 1929, and the work has only recently been completed. To date, the brush on 65 miles has been burned. During favorable weather, about two miles per week are burned over.

The plans call for two parallel lines, with a carrying capacity of 250,000 kilowatts with room in the center for a third line to be erected at some future time when conditions require it. In addition to these two power lines there may be constructed a wooden pole telephone line, with provision for a second line if necessary.

### Energy From the Sun

What would happen if the sun ceased to illuminate our earth? At first thought one might say that we could easily get along on our natural resources, but this argument would soon be shown to be faulty. The sun is the origin of all energy which exists, potentially or otherwise, on this earth.

Let us consider one of our greatest industries—the generation of electricity by water-power. Briefly stated, water flowing from the mountain lakes down the rivers is harnessed so that its force may impinge against the blades of a water turbine. This turbine is directly coupled to an electric dynamo, which converts the mechanical energy of the moving water into electrical energy. This electrical energy is transmitted through wires to the desired locality, where it encounters the resistance of the wires in the electric lamps, and thus reproduces its energy in the form of a filament which is made white hot and is commonly recognized as electrical illumination.

Now, the lake which supplied the water for the turbine must be supplied with water as rapidly as it loses it. Some work must be done to endow the water with this potential energy which ultimately results in electrical illumination. For this work the sun is the sole agent. During the day, when the humidity is low, the sun evaporates water from the lakes

and streams which rises in the form of clouds to the upper strata of the atmosphere. If the sun were not a hot body such evaporation could not take place. These clouds are swept across the land by winds, and when enough of the warmed vapor comes into contact with the cold air above, this vapor condenses and falls to the earth as rain, thereby replacing the water in the mountain lakes. Hence a continuous process—just as long as the sun supplies the earth with light and heat.

The origin of our coal deposits are also due to the sun. Fundamentally, coal is carbon, which resulted from the decomposition of carbonaceous plants and trees that lived many years ago. The sun was necessary for the existence of these plants, so that they could make their food. After dying, new growths sprang up, each going through the cycle of life and death, each succeeding plant piling upon the preceding one.

The result of this is an accumulation of carbonaceous material which is subject to great pressures, together with the sun's heat over an extended period of time. After being buried for several centuries, it is dug out of coal beds in the form of solid carbon, which is used as a fuel. This fuel, in turn, may be used to heat a steam boiler, the generated steam being used to drive an electric generator which converts the chemical energy of the coal into electrical energy. Similarly, for most of our organic fuels the sun is directly responsible, and without its beneficial rays both to plant life and animal life, existence on this earth would be impossible.

### Exciting Lamp Economy

In the interest of economy, the practice of leaving the exciting lamps burn on both machines during the entire performance should be discontinued, according to N. M. La Parte of Publix Theatres engineering staff. The present practice was instituted to eliminate the click heard throughout the house when the switch is operated, throwing in the lamps. Under ordinary circumstances, this click occurs once for each roll of film, and we doubt very much whether it is ever noticed in the audience.

The life of the exciting lamp is comparatively short, and they cost 78c each. By following this practice, their life would be increased 90% due to using them 5½ hours instead of 10 hours as at the present time.

By following this procedure, you are also increasing the life of the three vacuum tubes in the film amplifier which is operated by the same switch, and incidentally, reducing the wear on the storage batteries 40 ampere hours per day. This cuts down your charging rate and lessens the amount of current required to charge the batteries at night.



## New Equipment and Appliances

### New RCA Portable Recorder

**R**CA Photophone engineers, in collaboration with the engineers of the Westinghouse Electric & Manufacturing Company and the General Electric Company, have produced a new portable sound recording equipment for use in connection with the Mitchell camera that is claimed to be a very efficient apparatus in the field of out-door recording activities. For news reel and "location" work, it is said to meet demands that have heretofore been impossible, and in connection with the recording of industrial and commercial pictures and the chronicling of expeditions upon land and sea and in the air, the apparatus appears to fill a long-felt want. Including cables, cases and all accessories, the entire equipment weighs less than 400 pounds and can be easily transported in the rear compartment of a small automobile. The operating equipment necessary for "location" work weighs about 245 pounds.

The new outfit employs a combined camera and recorder designed to expose 35 mm. film at a speed of 90 feet per minute, a condenser microphone for sound pick-up, a portable recording amplifier, and the necessary power auxiliary and spare apparatus. The recorder head proper is mounted between the film magazine and the top of the camera. The recorder is made up of two main assemblies. In the optical system of the mechanical film-drive assemblies, a 32-volt D.C. drive-motor is provided to operate both the recorder and the camera. The speed of the film through the camera during operation must be maintained at 90 feet per minute, and for this purpose a speedometer on top of the recorder and a motor speed control rheostat is provided. A storage battery is used to operate the motor and is contained in an individual battery box. A mechanical fil-

ter system is incorporated within the recorder to prevent sudden changes in film speed. The tube condenser microphones are each mounted within a cubical metal case which also encloses a three-stage microphone amplifier.

The main recording amplifier is contained in its own individual case together with all batteries necessary for its operation, as well as for that of the interphone, the microphone, and the microphone amplifier. It consists of a Radiotron UX-864 transformer-coupled to the microphone amplifier cable. This tube is resistance-coupled to another Radiotron UX-864 which is in turn resistance-auto-transformer-coupled to a push-pull circuit utilizing tube Radiotron UX-112A; and the output transformer of the push-pull stage is used to operate the recorder galvanometer. The amplifier panel contains the necessary instruments and controls for the operation of the operation of the recording apparatus.

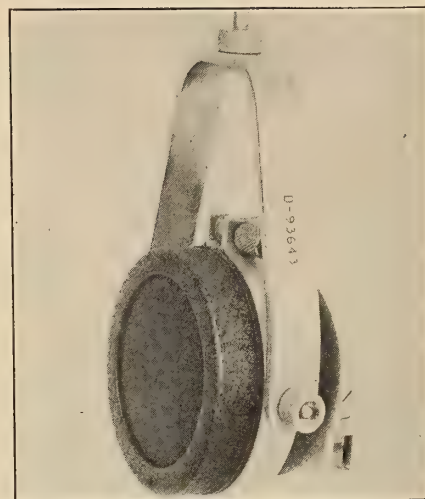
The unit for the recordist consists of a double-headband with a low impedance phone on one side for the inter-phone and high impedance phone on the other side for monitoring. The unit for the camera man consists of a single headband and one low impedance phone.

A feature of this apparatus is the adoption of the single system of recording by means of which the sound is recorded upon the film nineteen and a half, (19½) frames in advance of the exposure of the picture which makes possible the immediate reproduction of the subject after it has been developed and printed.

### New W. E. Microphone Effects Many Recording Improvements

A new Western Electric microphone operating on a principle similar to that of the first telephone transmitter used by Alexander Graham Bell is announced by Electrical Research Products for use in recording talking pictures. The microphone, already in use in a number of studios and known as the W. E. electrodynamic transmitter, possesses many improvements over the condenser-type microphone generally used in recording until now. The new transmitter is a development of the Bell Telephone Laboratories.

Its use eliminates several recording problems, one of which has been the difficulty in hiding the microphone from the view of the camera. The new microphone is smaller and its associated amplifier may be located as far as two hundred feet from the microphone, making it much easier to hide from the view of the camera. The amplifier for the condenser microphone was built as an integral part of the microphone housing and made it extremely difficult to camouflage in many sets.



W.E. electrodynamic transmitter

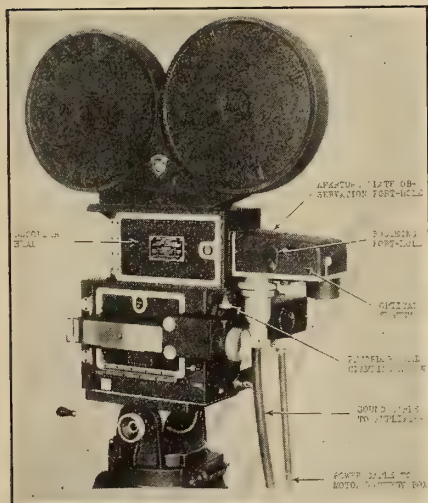
Other advantages of the new transmitter are that it is less affected by dust and moisture and need not be kept in a desiccator. It is unaffected by changes in temperature and barometric pressure. It is a further contribution in noiseless recording since its associated amplifier is quieter in operation. The transmission characteristics of the transmitter are superior, and distortion caused by cavity resonance has been practically eliminated, thus increasing quality and reality in recording. Increased volume is obtained, since the transmitter and associated amplifier give from 10 to 15 decibels more overall gain than the condenser transmitter and amplifier.

#### Principle of Operation

The principle on which the transmitter operates is the inverse of that employed in the well known Western Electric 555-W receiver used in the Western Electric Sound System. In this receiver or any dynamic loud speaker the magnet system is so constructed as to produce a circular air gap, across which extends a radial magnetic field, between the inner pole and the surrounding outer pole. In this air gap is situated a thin circular coil which is attached to the diaphragm. If a sound current is passed through this coil, the electrodynamic reaction between the current and the field will cause the coil to execute axial vibrations corresponding to the modulations of the sound current.

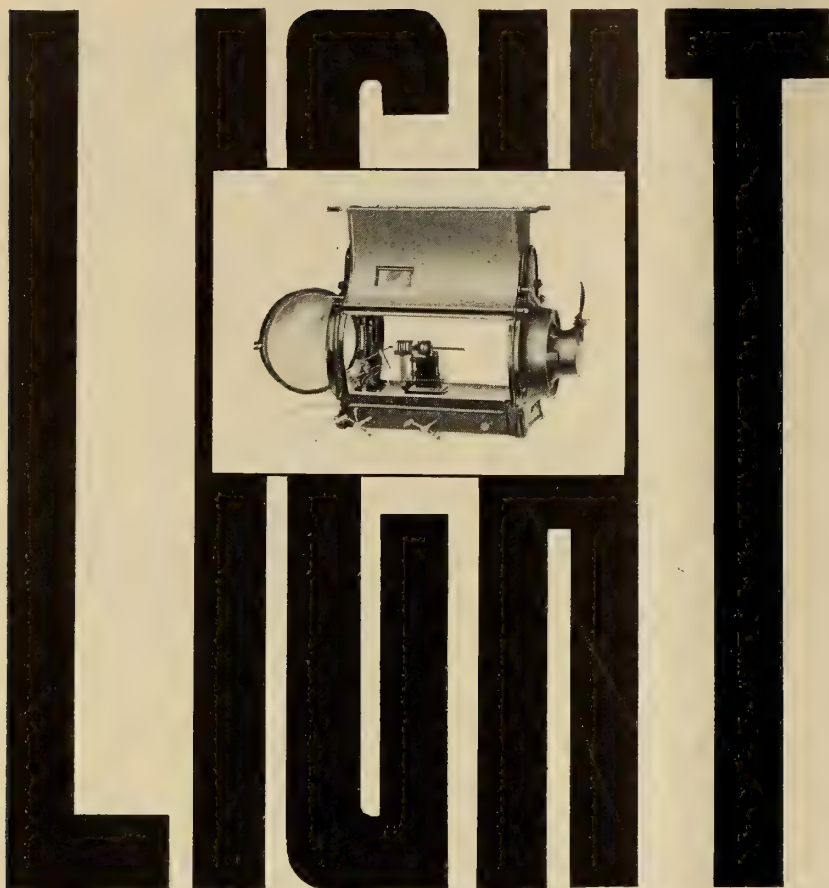
Through the medium of the diaphragm and horn, or baffle, these vibrations reproduce the original sound. This action can be readily reversed:—if a sound falls on the diaphragm, causing the diaphragm and coil to vibrate, there will be generated in the coil a small alternating voltage which corresponds to the impinging sound waves. This is the way in which the electrodynamic transmitter operates and indicates the origin of its name.

The construction of the new transmitter  
(Continued on page 36)



Film side of new RCA recorder, mounted on a Mitchell camera





in abundance for proper projection on

## ENLARGED SCREENS



### HIGH INTENSITY AUTOMATIC REFLECTOR ARC LAMPS

For Sale by Independent Supply Dealers

**The Strong Electric Corporation**

2501 Lagrange St., Toledo, Ohio

Export Office: 44 Whitehall St., New York, N. Y.

## IN WESTERN CANADA! CANADIAN THEATRE SUPPLY CO.

Authorized distributors for

**SIMPLEX—MOTIOGRAPH—POWERS—HOLMES**

and all theatre equipment of the leading manufacturers. Also, an extensive line of stage equipment.

*Complete Sound Picture Service!*

**306 Canada Building  
Winnipeg, Man., Canada**

Alberta Representative

**M. L. ADAMSON**

9921—113th St., Edmonton, Alb., Canada

## S. M. P. E. Spring Meeting

*(Continued from page 16)*

wave for the two outstanding types (single and double ribbon) is being considered. A new type of oscillograph (synchronous slit type), is being described. This oscillograph permits observing the behaviour of the valve at any frequency within the recording range.

## DEPTH OF FIELD OF CAMERA LENSES

*Arthur C. Hardy*

The usual formulae for depth of field are expressed in terms of the focal length and relative aperture of the camera lens. By expressing the depth of field in terms of the magnification between the object plane in sharp focus and the film, a very simple and rigorous formula results. This makes it evident that the depth of field of all lenses giving the same magnification is the same under comparable conditions. Since the lack of depth of field is important only when it is apparent to the audience viewing the projected picture, the theory is extended to include positive prints produced either by contact printing or by projection printing from a larger negative.

## OPERATING PROBLEMS OF RECORDING EQUIPMENT

*L. D. Grignon*

The organization of a Sound Department is treated briefly. Equipment requirements such as standardization, simplicity of circuits, and special test or lineup equipments are discussed. To provide a general idea of the necessary work to maintain sound recording equipment, transmission and electrical maintenance are touched upon with comment gleaned from past experience. General statements regarding records and reports showing their use as valuable tools in this work are included.

The latter part of the paper deals with a large studio installation, indicating how the methods outlined are applied. Photographs or slides are used for illustration with a few short narratives of actual problems which have occurred and their clearance.

## STORAGE AND HANDLING OF MOTION PICTURE FILM

*E. W. Fowler and L. B. Newell*

Several serious fires in film exchanges early indicated the need of careful attention to methods of storing and handling motion picture film. Many tests were run to determine proper methods of storage.

Film needs especial consideration in storage and handling because of low ignition temperature, rapidity of combustion, and quality of decomposing with little air, evolving poisonous, flammable gases. Fundamental safety precautions include: elimination of means of starting fires, adequate pro-



vision for control of fire, minimizing quantity of film subject to one fire, and ample means of exit. More important provisions of Regulations of the National Board of Fire Underwriters, based on above considerations, are discussed.

Because of possibilities of panic from fire or smoke in a motion picture theater, construction and protection of projection booth and care in handling of film are of great importance. Each booth in a theatre should have a vented cabinet for keeping film. Automatic sprinklers, although not much used, have been effective in controlling fires in projection rooms.

Film exchanges not protected by sprinklers have had a number of serious fires, while sprinklered exchanges have been free from fires of such severity. Quantities of film in rooms where people are working should be kept as low as possible. Vaults and cabinets strategically placed are of great value. Automatic events in each room will carry away the poisonous, flammable fumes of decomposing film. Film in vaults constructed and protected in accordance with the standard requirements is relatively safe.

Laboratories and studios also require good sprinkler protection. Congestion of workers with considerable quantities of film must be avoided for reasonable safety. Machines and workers in a laboratory should be separated as much as possible. For extinguishing fires in film and in the quantities of combustible material found in studios, water, and lots of it, is the best medium.

#### OPTICAL INSTRUMENTS AND THEIR APPLICATION TO THE MOTION PICTURE INDUSTRY

*I. L. Nixon*

This paper deals not with the optics of the photographic lens, motion picture projector, or studio illuminator, but rather with those instruments such as microscopes, photometers, etc., the use of which has contributed greatly to the advance of the motion picture art of today. A simple explanation is given on the different types of instruments and the general optical principles involved, and some of their specific applications, which indicate the debt which industry owes to optical science.

#### AN A.C.-OPERATED SOUND MOTION PICTURE REPRODUCING EQUIPMENT

*T. D. Cunningham*

This paper describes in illustrated form, the RCA-Photophone Type PG-30 sound motion picture reproducing equipment, which requires no batteries nor motor generator sets for plate, filament and bias voltage supplies, for operation in theatres wired with the normal 105 to 125 volts, 50- to 60-cycle, A.C. power. This equipment, primarily designed for theatres having seating capacities for 1,000 persons or less, operates with inaudible output "hum" under operating conditions, is economical of the space it occupies.

(Continued on next page)

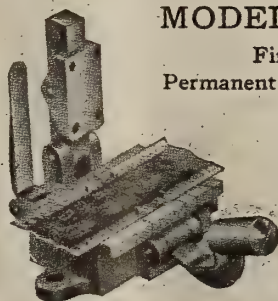
## EASTMAN'S LATEST CONTRIBUTION...

...is a remarkable super-speed panchromatic negative film that simplifies production, yields finer sound pictures than ever...and sells at the same price as regular negative. The whole industry is the winner by this latest Eastman development. Eastman Kodak Company, Rochester, New York. (J. E. Brulatour, Inc., Distributors, New York, Chicago, Hollywood.)

### EASTMAN SUPER-SENSITIVE

Panchromatic Negative, Type 2

## Universal Film Splicing Machine



MODEL NO. 3

Pat. March 22:22

First-Class Results on New or Old Film  
Permanent Gauge

No Adjusting

FOR THEATRES, EXCHANGES  
LABORATORIES, SCHOOLS

**Price \$6.00**

GENERAL MACHINE CO., INC.

816-826 East 140th St., NEW YORK, N. Y.

For sale by all Supply Dealers



## Good Projection Requires Good Rectification



M. P. 25-25

## Good Rectification Means FOREST RECTIFIERS

THIS Forest Rectifier meets the demand for a single unit to supply direct current for two projectors, and will furnish 15 to 25 amperes to either projector continuously.

It supplies a steady direct current, free from pulsations, and will produce a better light than other current supply devices. The only wearing parts are the bulbs which will last at least one thousand hours and usually much longer since only two bulbs are being used at a time (except during change over) and the load is alternately carried first by one set of two tubes then the other two as the projectors are alternately used.

This Forest Rectifier embodies the use of four rectifier tubes which are connected to supply current to two direct current circuits independent of each other, thus preventing loss of current at the first arc when the second arc is struck.

Both arc can be operated at the same time during the change over period and there will be no diminishing of the light from one projector while lighting up the second.

Two Ammeters are mounted on the unit which will show at a glance the amperage being used at either arc.

Links are provided for operating from 110-220 or 240 volts.

Rectifiers for all purposes made in 15 amp., 25-25 amps., 30, and 65 amps. sizes.

We are specialists in our field. Send us your technical problems. Literature on request.

## FOREST ELECTRIC CORP.

New and Wilsey Sts.

Newark

N. J.

## New Equipment and Appliances

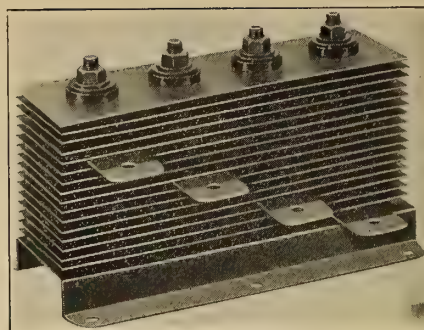
(Continued from page 33)

mitter is very similar to that of the 555-W receiver, except that instead of an electromagnet a permanent magnet of cobalt steel is used. There is, of course, no horn or baffle. The diaphragm is of thin duralumin. The coil is of edge-wound aluminum ribbon. The diaphragm is protected by means of a disc of perforated sheet metal mounted in front of it and this in turn is covered by a thin piece of black silk.

It is noteworthy that so far as is known this is the first time that the electro-dynamic principle has been used commercially in a transmitter, although in the first years of telephony Alexander Graham Bell employed a closely related principle by using one structure of the ordinary electromagnetic telephone receiver for transmitting.

## B-L Rectifying Units

A new line of heavy duty rectifiers has been announced by the B-L Electric Mfg. Co. of St. Louis and this supplements the line of smaller size rectifiers which they have had on the market for some years. These rectifiers are constructed entirely of metal plates without any moving parts and are of rugged construction. They are used to obtain low voltage, direct current from the ordinary alternating current lighting or power lines and for this purpose require the



B-L rectifying unit

use of small step down transformers.

Many applications exist for the use of such rectifiers in the fields of radio, sound - film equipment, signalling, alarms, industrial control, and many others.

## Constructional Features

Wherever low voltage, direct current may be required, the B-L rectifying units serve their purpose. In many applications the output current from the rectifier is entirely satisfactory. Other applications may require a filtering device to produce a current entirely free from pulsations. This

## S.M.P.E. Spring Meeting

(Continued from preceding page)

cupies, is easily serviceable, has an overall frequency characteristic anticipating future improvements in sound on film recordings, has sufficient undistorted power output for providing satisfactory distribution of sound in the type of theatres for which it is designed, and has provision for the addition of a remote-operated volume control where desired.

## MULTICOLOR PROCESS

R. M. Otis

A brief analysis is given of the way in which colors are reproduced using a two - color negative separation method. The Multicolor process, working on this principle, is then described. Details are given concerning film used, camera requirements, exposure, development, printing, and coloring.

It is possible to get with the Multicolor blue sound track, by proper processing, sound which is equally good to that with a black and white track.

## MOTION PICTURE SCREENS

Francis M. Falge

Motion picture screens, being the background for the picture, are very vital to its success. A poorly selected or poorly used screen will result in immeasurable harm to pictures on which huge sums of money are spent. A good screen surface costs so little that its importance is often deemed negligible, but its importance is beyond all comparison with its cost. This paper deals practically with this subject of selecting and using a screen to insure the best possible picture at all times.

## THEATRE EQUIPMENT

### NEW AND USED



Sound Equipment, Moving Picture Machines, Screens, Booths, Opera Chairs, Spotlights, Stereopticons, Film Cabinets, Portable Projectors, M. P. Cameras, Generator Sets, Reflecting Arc Lamps, Carbons, Tickets, Mazda Lamps and Supplies.

Projection Machines repaired and overhauled. Repair parts for all makes opera chairs. Attractive 3 x 10 ft. muslin banners, \$1.50; on paper, 50 cents.

We Pay Highest Prices for Used Projection Machines, Opera Chairs, etc.

Everything for the Theatre—Write for Catalog K.  
MOVIE SUPPLY CO., 844 So. Wabash, Chicago.

## THE BIOSCOPE

The Leading Journal of the  
British Cinematograph Industry

20th Year of Weekly Publication

Contains a complete section each week for the special benefit of Projectionists.

Cash prizes awarded for original ideas published. Specimen copies 18 cents.

Annual Subscription 7 dollars 50

THE BIOSCOPE PUBLISHING CO., Ltd.  
8-10 Charing Cross Road,  
London, W. C. Eng.



would be particularly true of sound picture work.

The B-L rectifying units are composed of a series of metal and composition discs arranged alternately on a bolt and separated by metal plates which form terminal lugs and act as spacers and ventilating fins. The characteristics of the discs are such that the current will flow only from the composition disc to the metal disc. This characteristic of certain combinations of elements has been known for a number of years, but it has been only in recent years that the principle has been put to practical application.

The rectifying discs, while acting as an electrical valve, find their most useful application when connected in a bridge circuit to give full-wave rectification. When so arranged, the unit rectifies both halves of the alternating current wave and gives a unidirectional pulsating current that is entirely suited to many industrial applications without any further modification. Higher efficiencies are obtained in this manner than if a single valve action, or half-wave rectifier, were used.

#### Transformer Requirements

The B-L rectifiers are in general applicable to all low voltage, direct current requirements. In such work, they require connection to a step-down transformer to give the suitable A.C. current required. Approximate values are given of the A.C. secondary voltage and the A.C. current in the secondary winding; both of these being stated for full load conditions for the corresponding full load D.C. amperes. Also the maximum safe allowable open circuit A.C. voltage is given. It should be noted that the regulation of any device using B-L rectifiers is dependent almost exclusively on the regulation of the transformer itself and to a very slight extent upon the rectifying unit. This means that when good regulation from no load to full load is required, the transformer must be of liberal de-

sign so as to have good inherent regulation characteristics.

The B-L rectifying units, like all dry, metallic rectifiers, are subject to gradual deterioration. This results in a gradual drop in output voltage. The length of life is influenced to a considerable extent by the current rating and for long life and dependable service, a conservative rating should be adopted. The construction of the B-L rectifying units lends itself to ready replacement at any time and at nominal cost as compared with the value of the complete device using it.

#### Sources of Power

Power is obtained from coal, oil and water, by use of prime movers in form of steam engines, gas engines and water wheels. Central stations



for better sound  
**INSIST  
ON  
VISITRONS**

Visitron Photoelectric Cells give greater volume with less background noise. They are guaranteed for six months, usually last more than a year, and require practically no maintenance. Get Visitrons from your nearest Branch of the National Theatre Supply Company.



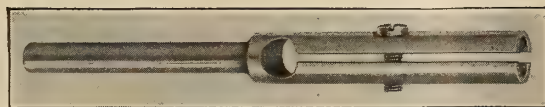
PHOTOELECTRIC CELLS  
**VISITRON**

REG. TRADE MARK

**G-M LABORATORIES INC**

1733 BELMONT AVE. CHICAGO, ILL.

## BEST CARBON SAVER FOR LOW INTENSITY LAMPS



Saves jaws of Lamp as well as Carbon. Made in all sizes.

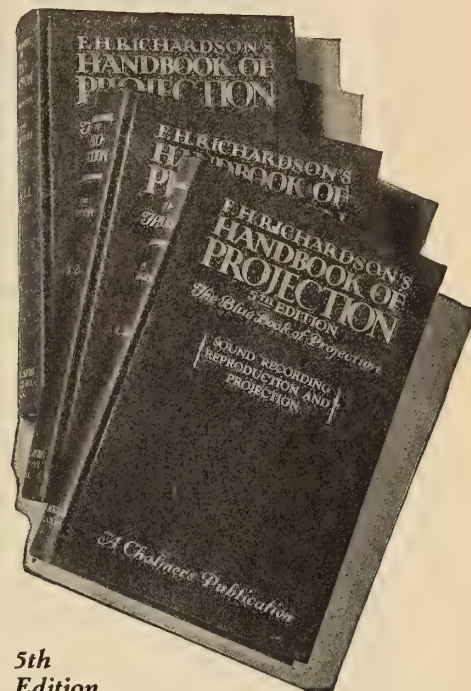
\$2.50 each at your dealer.

**BEST DEVICES CO.**

200 FILM BUILDING

CLEVELAND, OHIO

## THE BEST SELLER



5th  
Edition

### HANDBOOK OF PROJECTION

By F. H. Richardson

Back in 1910 Mr. Richardson wrote the first Handbook of Projection. It was a sell out. Second, third and fourth editions, each bigger and more successful have followed. The present fifth edition in three separate volumes, illustrated above, is the culmination of years of intensive effort.

Richardson is no swivel chair author. He knows the problems of the field—meets the men on their own ground. His books reflect a practical knowledge of just what information is needed. Recently he completed a 17,000 mile trip through the U. S. and Canada in the interests of projection.

#### CONTENTS

Volumes I and II are devoted entirely to the general subject of projection and everything related to it. Volume III deals exclusively with sound projection. All three volumes are profusely illustrated and contain over 1,400 pages of projection information written so you can understand it clearly. Each volume contains Richardson's famous question and answer index giving immediate access to hundreds of different problems.

These are the books which are being used by projectionists and theatre managers all over the world to secure improved results. Send for this finest of projection libraries today.

#### USE COUPON TO ORDER

CHALMERS PUB. CO. (M)  
516 Fifth Avenue, New York, N. Y.

Enclosed find (check) (money order) for \$10.25. Send Richardson's 3 volume Handbook of Projection to.....

#### WINNIPEG, CANADA

J. M. RICE & CO., J. M. Rice, Prop. Leading equipment dealers in all kinds of projection room equipment facilities. Representatives of leading equipment manufacturers of the United States and Canada. All our merchandise guaranteed for performance and stability. Whatever you want we will supply it.





## SUPER-LITE LENSES

WISELY CHOSEN BY  
AMERICA'S BEST THEATRES

### New Bifocal Super-Lite Lens

An adjustable focus lens with a wide range of foci for both silent and sound film.

### Series III. Super-Lite Lens

Standard full Half-Size lens furnished in short focus as low as 4" E. F. and up to 10" E. F.

### Series IV. Super-Lite Lens

Full 3" diameter lens to meet the demand for more light for longer throws. 6" E. F. to 10" E. F.

*Quality Guaranteed*

**PROJECTION OPTICS CO., INC.**

330 Lyell Avenue

ROCHESTER, N. Y.

U. S. A.

are established because it is inefficient to place a prime mover at each place where a small amount of power is required. Central stations are electrical because electrical power can be used more cheaply and more conveniently and turned into a greater number of uses than any other form.

Alternating current is generated by these stations because remarkable efficient machinery has been devised for "stepping up" the voltage and getting the great advantage of transmitting at high voltage. The same machine, a transformer, "steps down" the voltage, allowing it to be used at a low pressure. Transformers will not operate on direct current.

### Converter Substations

Converter substations are placed at points along the transmission line where a large amount of direct current is needed, and synchronous converters or motor generators are installed which change the alternating current to direct current. For converting a small amount of alternating current power to direct current, a mercury arc rectifier is used.

Transformer substations are erected wherever it is desirable to step down from the transmission voltage of between 22,000 and 250,000 volts to a city circuit usually from 2,300 to 11,000 volts. At the immediate points where the power is to be used, small individual transformers change this 2,300 volts to the 500, 220 or 110 volts desired.

### Short Transmission Systems

Short transmission systems for transmitting power six miles or less consist of an alternating current generator of from 2,000 to 11,000 volts connected directly to the line. At the receiving end of the line, synchronous motors, induction motors or converters may also be attached directly to the line. By attaching transformers to the line, small motors, incandescent lamps and arc lamps may be run at their proper low voltage. Long transmission systems are those which transmit power more than five or six miles.

### "Step-Up to High Voltages

The generator delivers 6,600 to 11,000 volts but this is "stepped up" by the station transformers, sometimes higher than 150,000 volts before it is delivered to the line.

Wherever power is to be used, either a transformer substation or a converter substation is erected. The former by means of transformers "step down" the voltage to about 2,300 volts for distribution of alternating current over a small area. The latter has a synchronous converter in addition to the transformers and delivers direct current power to a limited area.

## SOUND REELS

For Perfect Projection

### ALL-WELDED TYPE

One Unit

### LASTING DURABILITY

Bright Cadmium Plated

### UNIVERSAL ELECTRIC

9-16 Thirty-seventh Ave.,



—All Sizes—

### DEMOUNTABLE TYPE

Each side one unit

### ALL PARTS REPLACEABLE

Write for quotations

### WELDING COMPANY

Long Island City, N. Y.

Give This to Your Friend—Have Him Fill It in and Mail to us at Once

The Motion Picture Projectionist  
45 West 45th Street, New York City

Gentlemen:

Enclosed please find \$2.00 for which enter my subscription for one year (12 issues) starting with.....issue. (Two years, \$3.00.)

Name .....

Street ..... State.....

City..... Local No.....



## Selected Technical Glossary

(Continued from page 20)

**MAG.** Playback horn.

**MAGAZINE.** Camera or projector camera compartment (necessarily light-tight in a camera) holding the roll of unexposed film; also, the compartment holding the roll of exposed film.

**MAGAZINE VALVE, or MAGAZINE VALVE FIRE-TRAP.** Narrow opening, formed by two rollers, through which film passes in or out of projector magazines. The opening is so tight that no air can pass; hence the valve prevents flames from entering the magazine in case of fire.

**MAGNASCOPE (Magnascope).** An extra lens attachment to enlarge the image thrown from the projector.

**MAGNET, PERMANENT.** Magnet that retains its magnetism; contrasted with electro-magnet.

**MAGNETIC FIELD.** Region of magnetic influence surrounding a magnetic pole, and traversed by magnetic "lines of force", so that a magnetic needle (if free to move) will take up a definite position along a line of force.

**MAGNETIC FLUX.** "Lines of magnetic force" flowing from a magnet, proportional to its magnetic pole strength.

**MARKER.** Device for marking the negative, either photographically or mechanically, for locating points of synchronization between pictures and sound.

**MASKS.** Opaque or semi-transparent plates of various sizes or shapes, used in cameras or projectors to limit the effective area of the picture. Example, **KEYHOLE.** A mask may also be used to cover the sound track when desired.

**MASTER NEGATIVE.** Same as **MATRIX.**

**MASTER POSITIVE.** Same as **MOTHER.**

**MAT.** Same as **MASK.**

**MATRIX.** Impression obtained by electroplating of wax disc containing original sound record.

**MEAN FREE PATH.** Average distance which a wave (or particle) travels before encountering any object.

**MEGOHM.** Equals one million ohms.

**MEMBRANE, RUM.** See **RUM MEMBRANE.**

**METER.** (1) Unit of length in the metric system; equals 100 centimeters or 39.37 inches. Abbreviated **m.** (2) Measuring instrument (e.g., voltmeter, frequency meter.)

**METER, HARVEY.** See **HARVEY METER.**

**METER, HEYDE.** See **HEYDE METER.**

**mfd** Abbreviation for **MICROFARAD.**

**MICROFARAD.** Equals one-millionth of a **FARAD.** Abbreviated **mfd.**

**MICROPHONE.** Device for converting sound waves into variations in an electric current. See also **CONDENSER MICROPHONE.**

**MICROPHONE BOOM.** Crane-like device for supporting and manipulating microphone.

**MICROWATT.** One one-millionth of a watt.

**MIKE.** Slang for **MICROPHONE.**

**MIKE, SCRATCH THE.** To rub the finger over the metal screen in front of the microphone, in order to enable the mixer to find the line the mike is connected to.

**MIKE, SLICE THE.** See **SLICE THE MIKE.**

**MIKE STEW.** Undesired sounds heard by mixer.

**MIL.** One one-thousandth of an inch.

**MIL, CIRCULAR.** Area of a circle one mil in diameter.

**MILLI.** Prefix meaning one one-thousandth.

**MILLIMETER.** Equals 1/10 centimeter, 1/1,000 meter, or .039,37 inch. Abbreviated **mm** or **m/m.**

**MIRROR ARC.** See **ARC, MIRROR.**

**MIX.** To operate the **MIXER** (1).

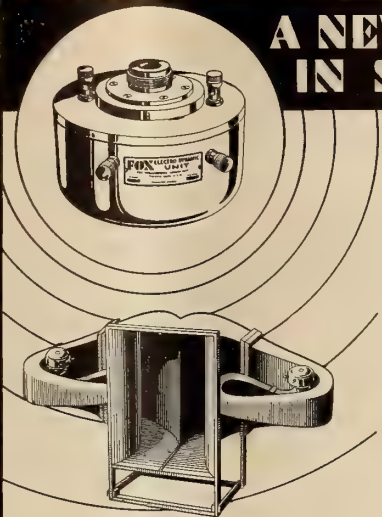
**MIXER.** (1) In recording, the apparatus which terminates the circuits from all microphones, and contains controls so that the recording apparatus will receive proper intensities from the various microphones. (2) The operator of **MIXER**, (1).

**mm** Abbreviation for **MILLIMETERS.**

**MODULATE.** To cause to vary from a normal value.

**MONAURAL.** Involving only one ear.

**MONITORING.** Listening, by means of




## A NEW DEPENDABILITY IN SOUND EQUIPMENT

Fox units not only command attention for their output volume and tone value—they offer definite exclusive coil and diaphragm features that insure continuous service.

The Fox Electro-Dynamic Unit and the Fox Rams Horn is a combination that outdemonstrates anything on the market.

*Improve your present equipment with a Fox Unit.*

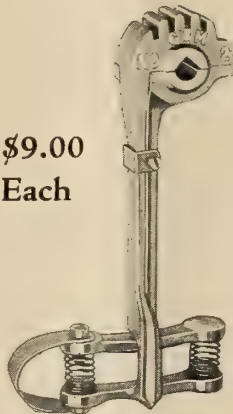
Complete sound engineering service. Estimates free for special work.



## ENGINEERING COMPANY

386-392 Dorr St., Toledo, Ohio, U.S.A.

# By Test Proven Best!



**\$9.00  
Each**

Imagine! Now on their second year of giving satisfactory service to Hi-Lo lamp users everywhere from Coast to Coast. Surely there must be a reason for this preference for the

**GEM CONTACT JAW**

Designed right, made right, and priced right.

*Order a Spare Now!*

**FOGELBERG ENGINEERING CO.**

128 S. Clinton St. Chicago, Ill.

Sold by Reliable Independent Dealers Everywhere

## KEEP all your COPIES of MOTION PICTURE PROJECTIONIST AS A REFERENCE FOR CURRENT AND FUTURE NEEDS—PRE- SERVE THEM IN A BINDER

# \$2<sup>25</sup> each

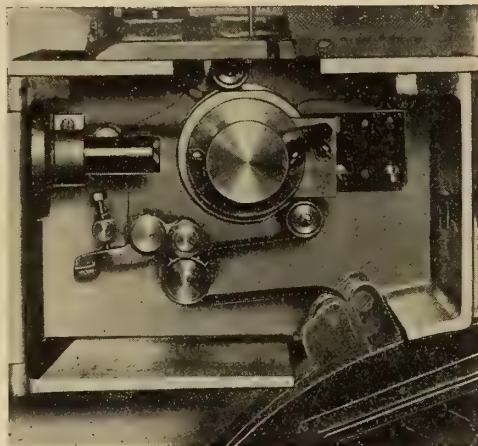
GOOD SOLID  
IMITATION LEATHER  
—GET ONE

ORDER FROM THE MOTION  
PICTURE PROJECTIONIST



# "SYNCHROFILM"

PERFECTION IN SOUND-ON-FILM REPRODUCTION—NO FINER SOUND SYSTEM IS OBTAINABLE AT ANY PRICE!!



No Friction on Film; Steady Drive; Patented Light Beam Optical System .0005 Wide; High Intensity.

All Wearing Surfaces Chromium Plated; Rollers Ball Bearing.

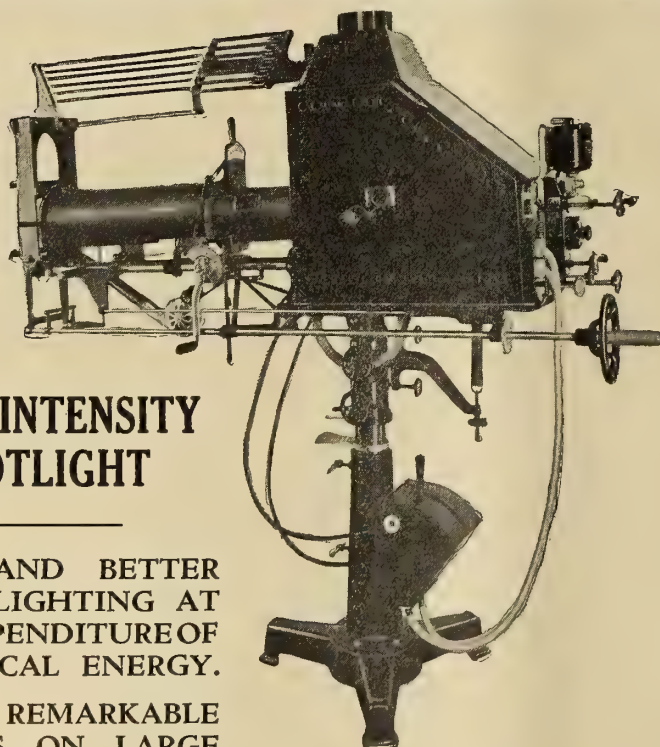
Easy to Install. Models for Simplex, Powers and Motiograph.

Price and Particulars on request.

## WEBER MACHINE CORP.

59 RUTTER ST., ROCHESTER, N. Y.

Export Dept., 15 Laight St., N. Y. C. Cable, "Ariab," New York



## HIGH INTENSITY SPOTLIGHT

MORE AND BETTER STAGE LIGHTING AT LESSEXPENDITURE OF ELECTRICAL ENERGY.

MOST REMARKABLE RESULTS ON LARGE STAGE SETS.

## HALL & CONNOLLY, INC.

24 Van Dam St.

New York, N. Y.



monitoring horn or receivers, to sound being recorded for purposes of control of volume and quality.

**MONITORING LOUDSPEAKER.** Loudspeaker for MONITORING, (1).

**MONITOR MAN.** Same as MIXER, (2).

**MONOCHROMATIC.** Single-colored.

**MOTHER.** Impression of MATRIX obtained by electroplating.

**MOTOR.** Almost always refers to an electric motor.

**MOTOR REGULATOR.** Adjustable rheostat used to vary motor speed.

**MOTOR-BOATING.** Of a recording system, producing sounds like a motor-boat exhaust, due to low-frequency oscillations in an amplifier circuit.

**MOTOR-GENERATOR.** Motor and generator connected together. The motor, driven by an electrical circuit, drives the generator for another circuit using a different voltage.

**MOVEMENT, IN-AND-OUT.** See IN-AND-OUT MOVEMENT.

**MOVIOLA.** Mounted peep-sight projection machine, in which the picture is seen through a small glass window and the sound is heard by means of ear-phones. Used by film cutters to expedite their work.

**MOVIE-TONE (Movietone).** (1) A method of variable density sound recording utilizing a slit of constant width and an Aeolight. (2) (movietone). Any variable density method of sound-on-film recording.

**MOVING PERIOD.** That portion of the picture cycle (in recording or in projection) during which the film at the aperture is in motion, expressed in degrees of revolution of the controlling flywheel ( $360^\circ = 1$  cycle.)

**M. Q.** Abbreviation for metal quinol, active ingredient of a commonly used developer.

**MULTICOLOR (Multicolor).** A type of subtractive process for obtaining color films. Two negative films are used, or else a SANDWICH FILM negative; the front one records the blue and green components of the scene; a dye permits only the orange and red components to pass to the back negative, which is panchromatic. The negatives are developed and printed in the normal manner on two sides of the same film. The two prints are then chemically converted respectively, blue-green and orange-red, in such a manner as to approximate the original colors; the print is then varnished for protection.

**MULTIPHASE.** Same as POLYPHASE.

**MUTUAL INDUCTANCE.** See INDUCTANCE.

## N

**NATURAL FREQUENCY, NATURAL PERIOD.** A FREQUENCY and PERIOD at which a certain body (or a certain electric circuit) vibrates most readily.

**NEGATIVE.** (1) Film developed after exposure in the camera. On the negative, dark and light are reversed from the objects photographed. (2) By analogy, a disc record in which the groove waves appear in relief, instead of indented as in the final record.

**NEON ARC.** Resembles NEON LAMP but is a long tube utilizing high voltage and high current.

**NEON LAMP.** Small bulb containing no matter except a little neon gas and two electrodes. When current is passed through this, the tube glows with a red light. It is very sensitive to small changes in current, and varies its brightness accordingly.

**NIGGER.** Black panel suspended from a boom or bar and used to shield the lens from certain high lights. A type of GOBO.

**NITRATE FILM.** Film whose BASE is composed mainly of cellulose nitrate.

**NO BOTTOM.** Sound deficient in low frequencies.

**NO TOP.** Sound deficient in high frequencies.

**NON-LINEAR RESPONSE.** See LINEAR.

## O

**OBJECTIVE.** In a system of lenses, the lens nearest the object being viewed or photographed. In projection, the lens nearest the screen.

**OBSERVATION PORT.** Opening in the wall of the projection room through which the projectionist observes the screen.

**OFF THE LINE.** Throw switches to disconnect all recording machine motors!

**O. K. ON THE BLOPS.** Sound-on-film reproducing system is complete.



**O. K. ON THE CLICKS.** Sound-on-disc reproducing system is complete.

**ON THE LINE!** Switch all recording machine motors into circuit!

**ONE BELL.** At certain studios, signal for silence at beginning of a take.

**OPACITY.** Reciprocal of TRANSMISSION (i.e., equals unity divided by transmission.)

**OPTICAL AXIS.** Straight line through the centers of the light source, lenses, diaphragm, etc., of an optical system, to which their planes are in general perpendicular.

**OPTICAL PRINTER.** See PRINTER, OPTICAL.

**OPTICAL SCRATCH.** Defect on sound track, occurring as a line parallel to the edges of the film, due to a particle of dust or mechanical imperfection in the slit through which light was sent to the sound track.

**OPTICAL SYSTEM.** Any apparatus which transmits and alters rays of light.

**ORDER WIRE.** Interconnecting telephone network for one channel.

**ORDINAL RESPONSE, or ORDINAL RELATION.** Said to occur when increasing one quantity automatically increases another, and decreasing the one automatically decreases the other. An ordinal relation is not necessarily linear.

**ORTHOCHROMATIC EMULSION or FILM** is sensitive to yellow and green as well as blue and violet, but not appreciably sensitive to red.

**ORTHOCHROMATIC PHOTOGRAPHY.** Photography in which colored objects are rendered in monotone according to their true visual brightness.

**OSCAR.** Slang for OSCILLATIONS.

**OSCILLATING CIRCUIT.** Electric circuit which offers very little opposition to the establishment of an oscillating current of the frequency to which the circuit is tuned.

**OSCILLATIONS.** Waves, particularly of high-frequency alternating current.

**OSCILLOGRAM.** The record produced by an OSCILLOGRAPH.

**OSCILLOGRAPH.** The device used for recording vibrations.

**OUTSIDE LINES.** The area beyond the camera's visual angle.

**OVERALL.** Involving all factors which enter into a process.

**OVERCUT.** See CUT OVER.

**OVERONE.** Badly developed.

**OVERSHOOTING OF SOUND.** See SOUND OVERSHOOTING.

**OVERTONE.** Any vibration of higher frequency than the fundamental. Generally one whose frequency equals the fundamental frequency multiplied by an integer (whole number).

## P

**PAM or PAN.** Contraction of PANORAMA.

**PANCHROMATIC EMULSION or FILM** is sensitive to all visible colors.

**PANEL.** Heavy sheet of insulating material on which electrical apparatus is mounted.

**PANORAM.** Same as PANORAMA HEAD.

**PANORAMA.** Rotation of a motion picture camera in the horizontal plane, without changing the position of the tripod.

**PANORAMA HEAD.** Revolving device on camera tripod, to permit taking of panoramas.

**PAPER CONDENSER.** See CONDENSER, PAPER.

**PARTIAL.** Same as OVERTONE, in the usual sense of the latter.

**PATCH-BAY.** Relay rack in which the circuits from all recording positions (either on the stage or outside) terminate. Any trunk may be connected with any other through the equipment of the patch-bay.

**PEC or P. E. C.** Contraction of PHOTO-ELECTRIC CELL.

**PERIOD.** Time occupied by one cycle of a wave. The reciprocal of frequency.

**PERIOD, NATURAL.** See NATURAL PERIOD.

**PERIOD, MOVING.** See MOVING PERIOD.

**PERIOD, PROJECTION.** See PROJECTION PERIOD.

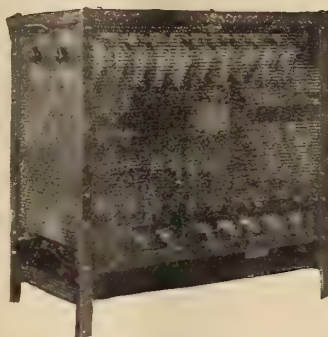
**PERIOD, STATIONARY.** See STATIONARY PERIOD.

**PERMEABILITY.** A quantity measuring the susceptibility of a substance (generally containing iron) to magnetization.

**PERSISTENCE OF VISION.** Property of the human eye which causes an impression of

# Hoffmann-Soons

## PERFECTION



### Look at Your Losses

Sound screen and color are the hijackers of light rays—taking, with other losses, approximately 80% of your amperages.

In hundreds, if not thousands, of theatres, crowded attendance is thinning out. Profits shrinking. Because pictures are projected with insufficient light.

Swell your box office receipts with the remedy—Perfection Multiple Coil Rheostats, the world's best. Let us mail our new catalog telling all about it.

### THE ONLY UNION MADE RHEOSTAT

Sold by Sam Kaplan, and National Theatre Supply Co., New York, and by your dealer.

### HOFFMANN-SOONS

Electrical and Engineering Corporation  
387 First Ave., Mfg. Division, New York  
Contracting Electrical Engineers—Moving Picture Theatre Electrical Specialists

# RHEOSTATS

## Your Preference, Please!

THE editors of MOTION PICTURE PROJECTIONIST solicit your aid to the end that this publication may be of the maximum service to you. Every subscriber can do his bit to improve this service by using the space provided below to indicate his preference for special articles and other material in which he may be particularly interested.

Let us know your preference, please. All requests will receive attention in the order of their receipt, so act quickly. Use the blank below to tell us in just what subject you are particularly interested. Do it now!

Editor,

M. P. PROJECTIONIST:

I am interested in the following subjects, on which I should like to see information in MOTION PICTURE PROJECTIONIST:

1. ....
2. ....
3. ....
4. ....

NAME .....

ADDRESS .....



an image to persist for a short time after the light causing the image has ceased.

**PHASE.** Degree to which a whole wave or vibration is displaced from a standard position.

**PHASE, IN.** Coinciding in vibration or rotation.

**PHASE, FIRST.** See **FIRST PHASE.**

**PHASE, SINGLE.** Generated and distributed a c involving only two wires and a single voltage wave.

**PHASE, THREE.** Generated and distributed a c involving three or four wires, employing three currents whose waves are not in the same phase.

**PHASE, TWO.** Same as three-phase, but involves only two currents.

**PHASED.** Ready to start in synchronism—said of motors for driving sound—and picture-recording equipment.

**PHOT.** Metric unit of illumination. Equals intensity of illumination on a surface in lumens, divided by area of the surface in sq. cm.

**PHOTOACTIVE.** Sensitive to light, as photographically or photoelectrically (cf. **PHOTOELECTRIC EFFECT**.)

**PHOTOCELL.** Contraction of **PHOTOELECTRIC CELL**.

**PHOTOELECTRIC CELL, PHOTOELECTRIC EFFECT.** Certain chemical elements emit electrons when exposed to light of certain wave-lengths (colors), the number of electrons emitted depending on the intensity of the light. This effect enables us to transform light into electricity, since electrons in motion constitute an electric current. In a photoelectric cell, a piece of such an element is used as a cathode; the freed electrons flow to a plate (the anode) and a current flows in the external circuit. These cells do not contain air, which would chemically attack the sensitive element. Abbreviation, **PEC**.

**PHOTOELECTRIC-CELL AMPLIFIER.** Amplifier which first amplifies the small current from a photoelectric cell.

**PHOTOELECTRONS.** Electrons liberated by light when the photoelectric effect takes place.

**PHOTOGRAPHIC EFFICIENCY.** See **EFFICIENCY, PHOTOGRAPHIC.**

**PHOTOMETER.** Any device for measuring light intensity.

**PHOTOPHONE (Photophone).** A variable area method of recording sound on film; also the method of reproducing the sound.

**PICK-UP, A-C.** See **A-C PICK-UP.**

**PICK-UP, SOUND.** See **SOUND PICK-UP.**

**PICTURE CYCLE.** Entire series of mechanical operations which takes place between the positioning of one frame of film and the positioning of the next frame.

**PILLOW DISTORTION.** Lens fault which causes the images of parallel lines to curve inward toward one another.

**PIPE IT DOWN!** Same as **DOWN THE CHUTE!**

**PITCH.** (1) That property of sound which is determined by the frequency of the sound waves. SEE **FREQUENCY.** (2) Distance from the center of one perforation on a film to the next; or from one thread of a screw to the next; or from one curve of a spiral to the next.

**PLATE.** The anode of a vacuum tube or photoelectric cell.

**PLATE BATTERY.** Same as "**B**" **BATTERY.**

**PLAYBACK.** (1) Reproduction of a sound taken from the wax disc for critical purposes. (2) Special, extremely light reproducer, for use on the original wax record before the disc is electroplated.

**PLUG.** Terminal of an electric wire, made for insertion into jacks.

**PLUG 'EM IN!** Take the second step in preparing cameras and recording machines for synchronization.

**POLARIZING VOLTAGE.** Voltage determining the direction of current in a circuit.

**POLYPHASE.** Includes **TWO-PHASE**, **THREE-PHASE**, and higher numbers of phases, in a-c circuits.

**PORT, OBSERVATION.** See **OBSERVATION PORT.**

**POSITIVE.** (1) Film onto which light is sent through the negative, in order to print densities corresponding substantially to dark and light on the original objects. (CF **NEGATIVE.**) (2) By analogy, a disc record in which the grooves are indented (as in the final record instead of raised.)

**POST-SCORING.** Addition of music and/or

dialogue to a picture which has already been photographed.

**POTENTIAL.** Level of electric pressure.

**POTENTIOMETER.** Device controlling or measuring the electromotive force (voltage) across one or more circuits, by placing each of these in parallel with a variable part of a fixed resistance.

**POWER.** Rate of doing work or producing energy. Equals work or energy divided by time taken to produce it.

**POWER AMPLIFICATION (of an amplifier).** The ratio of the alternating-current power produced in the output circuit to the alternating-current power supplied to the input circuit.

**POWER AMPLIFIER.** (1) An amplifier capable of handling large amounts of electrical energy. (2) Specifically any of the amplifiers used to magnify the currents obtained from the gain amplifier.

**POWER STAGE.** The final stage of amplification.

**POWER TUBE.** A high-output vacuum tube.

**PRE-SCORING.** Preparation of a sound record to correspond with a scene not yet photographed.

**PRINT (noun).** The **POSITIVE** after exposure and development.

**PRINT (verb).** To produce a **POSITIVE** film.

**PRINTER.** Machine for the exposure of prints.

**PRINTER, CONTACT.** In this type of **PRINTER** the positive and negative are in direct contact as each frame is exposed.

**PRINTER, OPTICAL.** In this type of **PRINTER** the light transmitted by the negative passes through an optical system before reaching the positive it affects. (Compare **PRINTER, CONTACT**.) Such a printer permits various effects such as changes in apparent speed of recorded motions, or variations in size of image.

**PRINTER LIGHT.** In **PRINTING**, the source lamp.

**PRINTING.** Process of making a positive from a negative.

**PRINTING, DOUBLE.** See **DOUBLE PRINTING.**

**PROBUS PAINT** has a high resistance to chemical action, and is therefore much used for painting tanks and trays used in photographic development.

**PROCESSING.** Generally means all treatment of a film subsequent to exposure.

**PROJECTION, AXIS OF.** Straight line from center of aperture to center of image on screen.

**PROJECTION BOOTH.** Booth containing projection equipment. See discussion under **PROJECTION ROOM.**

**PROJECTION DISTANCE.** Distance from projection lens to screen.

**PROJECTION LENS.** In projection, the objective lens.

**PROJECTION PERIODS.** Total fraction of the picture cycle during which the picture is being projected. CF. **MOVING PERIOD, STATIONARY PERIOD.**

**PROJECTION ROOM.** There is some confusion in the use of this term. It is common studio practice to refer to the small viewing rooms or theatres on the lot where dailies are shown as projection rooms. Projectionists, however, use the term to apply specifically to the room in which the projection equipment is located. The word projection booth is virtually obsolete.

**PROJECTOR.** Machine used to project motion pictures.

**PROJECTOR, CONTINUOUS.** See **CONTINUOUS PROJECTOR.**

**PUSH-PULL AMPLIFIER.** An amplifying apparatus, employing two amplifier tube, designed to obtain greater amplification with less distortion.

*(To be continued)*

## Mohair as a Sound Absorbent

Sound-absorption tests on mohair velvet upholstery, recently conducted by the Mohair Institute in a moving railroad train, revealed a number of interesting and important facts for the guidance of theatre and hotel

## Index of Advertisers

Bausch & Lomb Optical Co. ....	5
Best Devices Co. ....	37
Bioscope, The. ....	36
Brenkert Lt. Projec. Co. ....	6
Canadian Theatre Supply Co. ...	34
Chalmers Publishing Co. ....	37
Eastman Kodak Co. ....	35
Fish-Schurman Corp. ....	5
Fogelberg Engineering Co. ....	39
Forest Electric Corp. ....	36
Fox Engineering Co. ....	39
General Machine Co. ....	35
G-M Laboratories, Inc. ....	37
Hall & Connolly, Inc. ....	40
Hertner Electric Co. ....	7
Hoffman & Soons, Inc. ....	41
Ilex Optical Co. ....	Front Cover
International Projector Corp.,	Back Cover
Kaplan, Sam, Mfg. & Supp. Co. ...	2
Movie Supply Co. ....	36
National Carbon Co. ....	4
National Theatre Supply Co. ...	43
Projection Optics Co. ....	38
Rice, J. M., & Co. ....	37
Roth Bros. & Co. ....	3
Strong Electric Corp. ....	34
Technicolor, Inc. ....	8
Universal Elec. Welding Co. ...	38
Weber Machine Corp. ....	40
Western Electric Co. ....	11

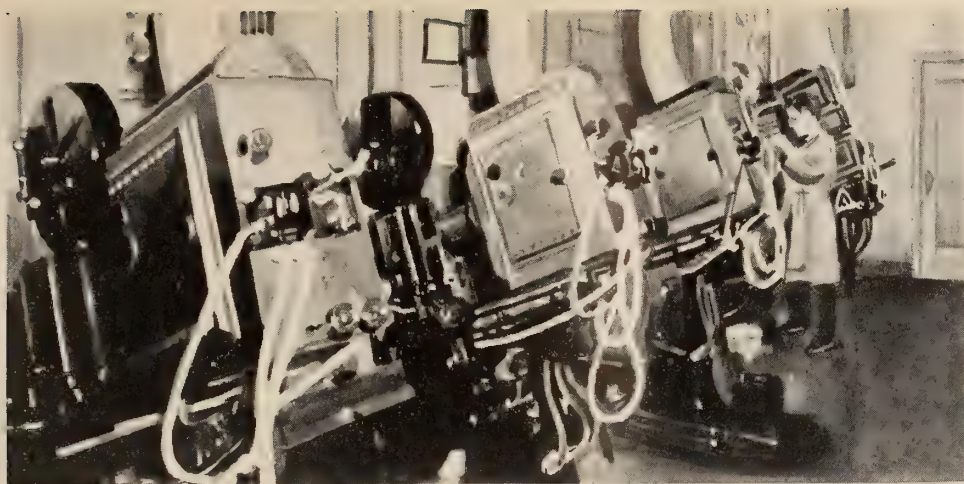
men and interior decorators who desire a fabric that has acoustical as well as other helpful properties.

The experiments, which were made by Dr. William Braid White, nationally known authority on acoustics, showed that mohair velvet is especially effective in absorbing or failing to reflect the high-pitched noises, the ones most disturbing to the human ear. These high pitched or high frequency sounds are particularly irritating to anyone seeking relaxation and enjoyment in a theatre, therefore a reduction of these disturbing noises by the proper use of mohair velvet upholstery would naturally be a service to the theatre patron.

### Seat Position a Factor

The relation of mohair velvet to good acoustics is being further demonstrated in research conducted by the American Seating Company. Their engineers have found that the use of mohair definitely increases the sound absorption and its effect is so marked that there is a ten per cent increase in absorption when the mohair velvet seats are in the down position instead of the raised position.





## **AMERICA'S BEST PROJECTION ROOMS ARE EQUIPPED THROUGH NATIONAL SERVICE**

The next time you enter an exceptionally well equipped projection room—complete in every detail and up-to-the-minute with reliable projection aids—just ask, “Who equipped this?” Nine times out of ten the answer will be, “National.” The best projection equipment available comes from some one of 31 National Branches. Some of it is sold by them exclusively and cannot be procured from any other source. All of it can be purchased there with greatest convenience and economy. National’s rigid standards of quality protect you against the possible purchase of impractical or unreliable equipment. When you hear of some new projection aid—or see a new improvement advertised—“check” up on it at your nearest National Branch . . . If it’s worth buying, they’ll have it in stock.



**NATIONAL THEATRE  
SUPPLY COMPANY**  
*Branches in all Principal Cities*

**IF IT'S WORTH BUYING YOU CAN BUY IT BETTER AT NATIONAL**

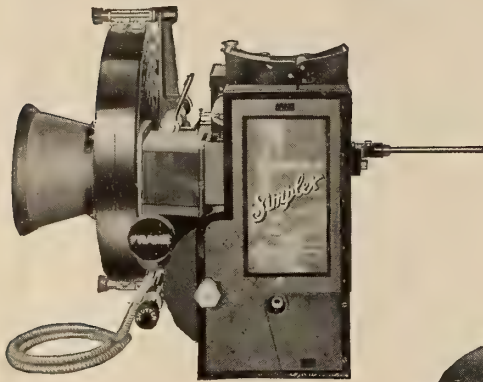


# SIMPLEX ACCESSORIES

FOR

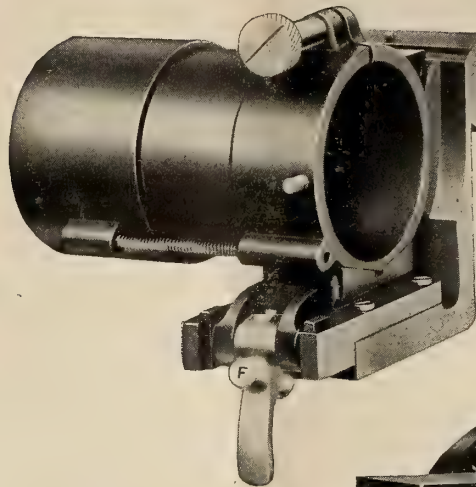
*Simplex*  
TRADE MARK REG'D.

## PROJECTORS



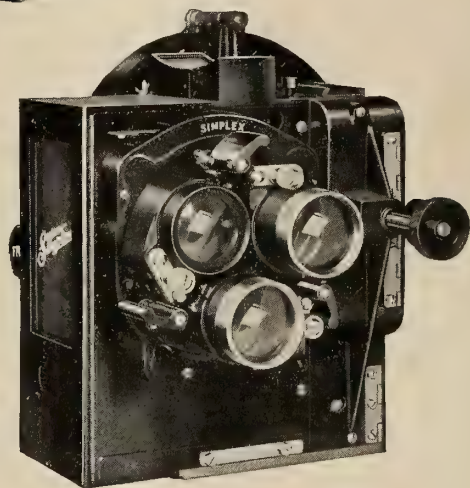
*Simplex*

Rear Shutter Attachment



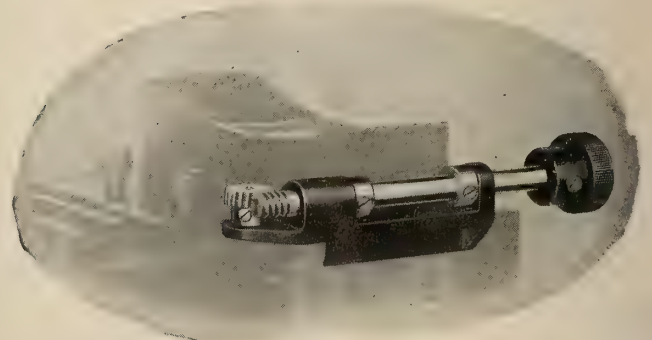
*Simplex*

Lens Aligning Device



*Simplex* Triple Lens Turret

Send for Booklets Giving Full Particulars



*Simplex* Lens Focusing Assembly

## INTERNATIONAL PROJECTOR CORPORATION

90 GOLD STREET

GENUINE SIMPLEX PARTS GIVE MOST SATISFACTORY RESULTS

NEW YORK



# MOTION PICTURE PROJECTIONIST

*(Fourth Year of Publication)*

## THE ILEX F:2.5

STANDARD ADJUSTABLE  
PROJECTION LENS

### SHORT FOCAL LENGTHS

A new era in screen presentation brings forth larger pictures and wider screens. "Grandeur" effects from 35mm. film are now possible for every theatre with ILEX, offering the finest short focal length lenses that the present day market affords. This is true because ILEX lenses are corrected for critical definition, maximum sharpness, brilliant illumination and flatness of field. Slop-over and incomplete covering of the screen are cared for by the exclusive ILEX adjustable feature.

For the projection equipment you use, ILEX lenses are the best . . . perfect in performance . . . faithful in service. We can furnish engineering data and interesting literature to cover your projection problems.

ILEX OPTICAL CO. ROCHESTER, N. Y.



FURNISHED IN A WIDE RANGE  
OF FOCAL LENGTHS  
2½" to 9"



OPTICAL PRODUCTS OF PRECISION

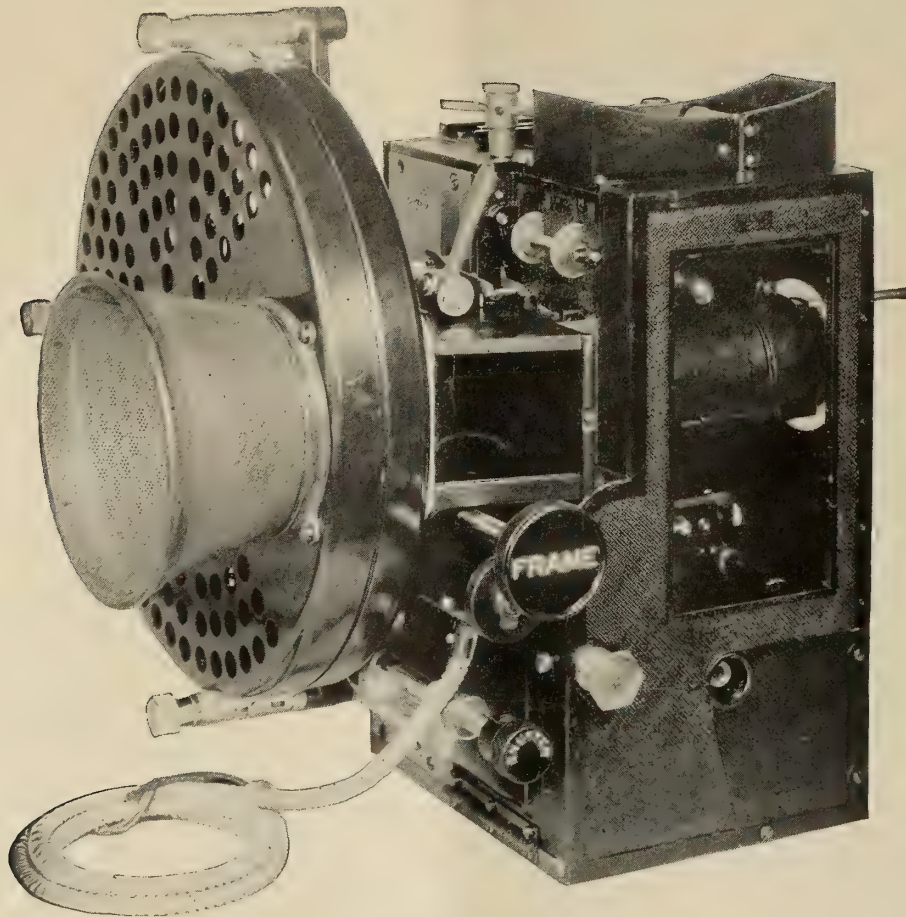
# ILEX OPTICAL CO.

INSIST UPON ILEX — THE LENS THAT PUTS PERFECTION IN PROJECTION



*Now Ready!*

# KAPLAN REAR SHUTTER



Can be Attached to Any Sure-Fit  
or Simplex Mechanism

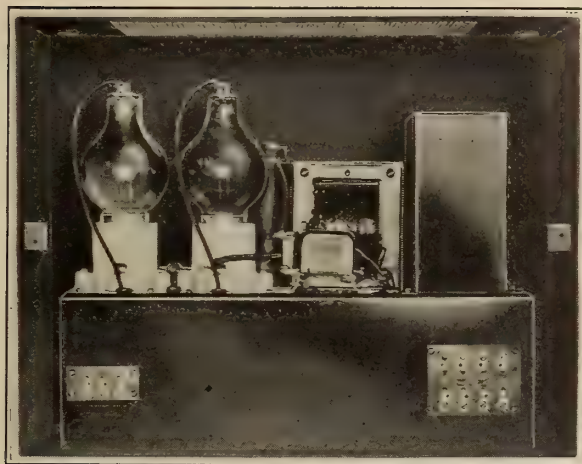
*See your local dealer or write to us*

Sam Kaplan Manufacturing and Supply Company, Inc.  
729 Seventh Avenue :: New York City

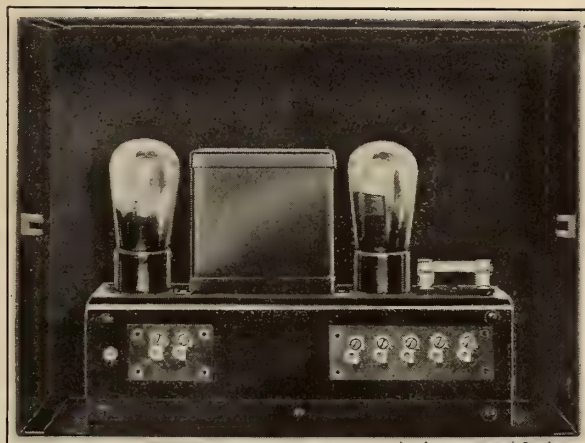


# SYNCHROFILM

**Now!** Announces, after exhaustive tests under actual operating conditions, the  
*Complete Conversion of*  
**SYNCHROFILM TO A. C. OPERATION**



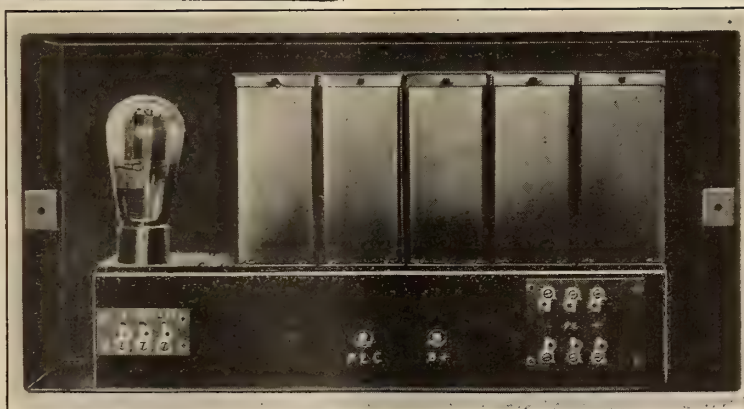
*"A" Supply*



*Head Amplifier*

No "B" Batteries to  
Test or Replace

No Motor Generators



*"B" Supply*

No More Mussy "A"  
Batteries to Recharge  
or Require Attention

**Absolute and Perfect Exciter Lamp Control and  
Head Amplifier Filament Supply**

No "Bugs"—"Bees"—"Hornets"—or "Buzz-Saw"  
Sound Effects—No Hum

**Assured Quietness and Simplicity of Operation**

## **Weber Machine Corporation**

**59 Rutter Street**

*Export Dept.: 15 Laight St., New York City*

**Rochester, N. Y.**



THEY KEEP A-RUNNING



20/40 to 100/200 Ampere 2-Bearing Actodecor

## Projection Arcs of UNIFORM INTENSITY



ROTH  
ACTODECOR  
CONTROL  
PANEL

Screen illumination of uniform intensity and unvarying brilliance—even during change-over—is secured by the use of Roth Multiple Arc Type Actodecors, because they supply steady direct-current power of the proper voltage to the arcs. They are built to meet projection booth requirements for silent or sound pictures. Any number of arcs can be carried within their ampere ratings—sizes range from 20 to 600 amperes . . . Furnished in 2- and 4-bearing types, dynamically balanced.

### ROTH BROTHERS AND COMPANY

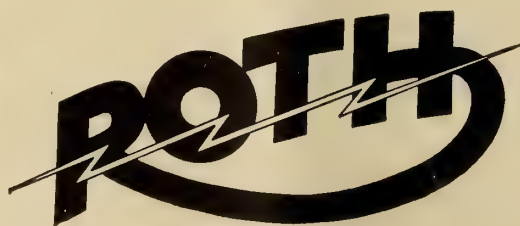
*Division of Century Electric Company*

1400 W. Adams St.

Chicago, Ill.

*Distributors and Offices in all Principal Cities*

DIRECT CURRENT  
MOTORS AND  
GENERATORS



MOTOR GENERA-  
TOR SETS AND RO-  
TARY CONVERTORS

ACDC-7



# MOTION PICTURE PROJECTIONIST

July, 1931

Vol. 4, No. 9

JAMES J. FINN, Editor

Lester Isaac, *Efficiency*; J. H. Kurlander, *Light*; Thad Barrows, *Conservation*; J. E. Robin, *Equipment*; Samuel Wein, *Research*; R. H. McCullough, *Sound Projection*; Harry Rubin, *Improvement*; Victor Welman, *Personnel*; Sidney Burton, *Production*

Published monthly by Mancall Publishing Corp., 7 West 44th St., New York City. Subscription rates in U. S. and Canada: twenty-five cents per copy; two dollars per year; three dollars for two years. Add one dollar for foreign postage. Changes of address should be submitted three weeks in advance of publication date to insure receipt of current issue. Entered as second class matter Oct. 25, 1927, at Post Office, New York, N. Y., under the act of March 3, 1879. Additional entry at New Brunswick, New Jersey.

## Canadian Representative

H. N. Elliott, 203 Vaughan Road  
Toronto, Canada.

## Australian Representative

McGill's Agency  
179 and 218 Elizabeth St.  
Melbourne, Australia.

Advertising Manager  
Mortimer Glancoff

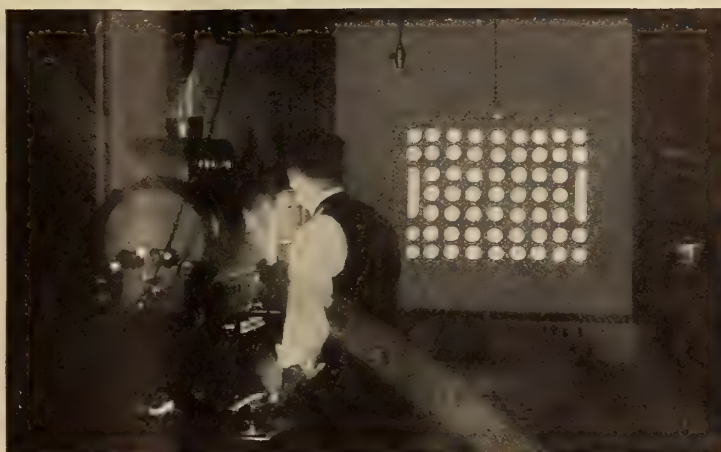
Editorial & Advertising Office  
7 West 44th St.  
New York City.



## Full-Stage Scanning Now Possible in Television Work

By means of a new television camera exhibited at the Chicago R.M.A. show the use of a stage has become an accomplished fact in television. The new camera is now ready to be used to enlarge the size of pick-up space in the studio and makes the televising of outdoor scenes a matter of short period and adaptation.

In experimental work at W2XCD the camera has supplanted the flying spot method entirely. Under the older flying spot method in use at all of the stations now on the air with anything like programs, the object to be televised was limited in size to close-up bust image or part of the person. A dancer could be seen from the hips down, or a singer or speaker from the waist up, but the full-length image was out of the question. With the camera pick-up the image can take in a space four feet deep by seven feet wide by seven feet high with great detail, and outdoors the pick-up of a moving train, automobiles, and airplanes in flight has already been accomplished on several occasions.



*One of the strict tests to which Super  
Cinephors are subjected*

## GOOD SHOWMANSHIP

Good showmanship consists of pleasing the public. The wise theatre manager realizes that the heart of his appeal is the character of his projection facilities.

The new Super Cinephor Lens and Condenser System is revolutionary. The lens is the first true anastigmat ever offered for projection, giving a great increase in image quality and covering power. The condenser system supplies from 50 to 100% more light than any other condenser system now available.

Write for the complete details. Ask for catalog E-16.

BAUSCH & LOMB OPTICAL CO.

680 St. Paul Street

Rochester, N. Y.



# BAUSCH & LOMB

Makers of Orthogon Eyeglass Lenses for Better Vision

F. S. C.

Genuine Optical Crown Glass Plates

Enclose Portholes for Perfect Sound Projection

PRECISION SURFACES

NO DISTORTION

S. O. G.

"IGNAL" CONDENSERS

Extra Heat Resisting Optical Glass

ALL SIZES

ALL FOCAL LENGTHS

FISH-SCHURMAN CORP.

45 WEST 45TH STREET

NEW YORK, N. Y.



## Adapters for

# 211-E . . 50 WATT tubes

for use with

## WESTON SOUND APPARATUS TEST SETS • MODELS 565 and 566

● Sound apparatus test sets are vitally necessary in the projection booth of the modern theater which features quality sound reproduction. Amplifier tubes, speaker-coils, batteries and the vast number of electrical circuits must be checked at regular intervals to assure continuous and satisfactory performance. For this work, the dependable, accurate operation of Weston Test Sets is invaluable.

● To make Weston Test Sets even more useful to the projectionists, Weston has designed an adapter which permits 50 Watt, type 211-E tubes, to be checked quickly and easily. It may be used with either Weston Model 565 or 566.

● Model 565 is a three meter test set. It is practically a portable testing laboratory. It makes every electrical test that might be necessary in the servicing of sound apparatus and the attendant equipment. It is recommended for the larger theaters.



Model 566

● Model 566 is a compact, light, relatively inexpensive two meter test set, designed to give the projectionist the necessary readings to intelligently service sound apparatus. Model 566 Weston Test Set is considered the standard equipment for servicing sound apparatus and public address systems.

# FREE →

to Projectionists

A free "Copy of Instructions," showing how Weston Model 566 Test Set can be used, will be sent to all projectionists who request it on their theater's letterhead.

## WESTON ELECTRICAL INSTRUMENT CORP.

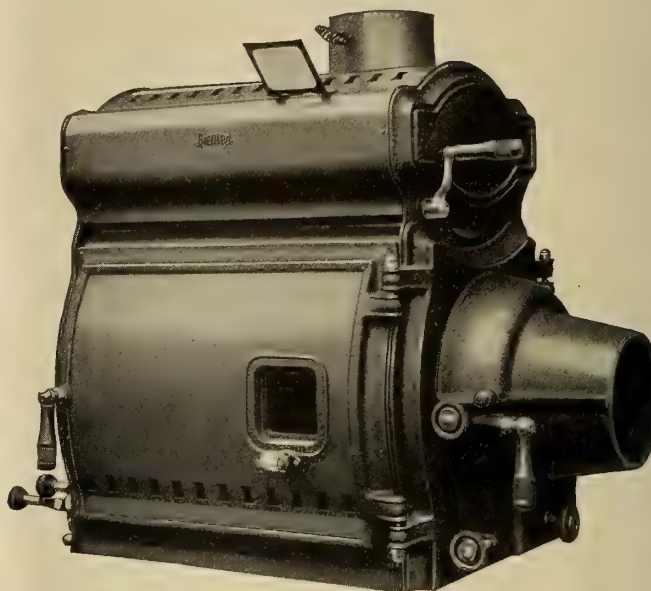
617 Frelinghuysen Avenue

Newark, N. J.

# Brenkert

## SUPER HIGH INTENSITY PROJECTION LAMP

IS NOW USED IN MANY LARGE AND  
FINE THEATRES FROM  
COAST TO COAST



The reason is:

**SUPERIOR SCREEN RESULTS  
LOW MAINTENANCE COSTS  
CONSISTENT PERFORMANCE**

Your theatre can profit by these advantages. A demonstration will convince you. Manufactured and guaranteed by one of the oldest and largest manufacturers in the industry.

*Distributed by independent supply dealers throughout  
the United States*

Ask  
Any  
User



Write  
for  
Literature

CORRECT DESIGN—PRECISION CONSTRUCTION

## BRENKERT LIGHT PROJECTION CO.

Engineers & Manufacturers

ST. AUBIN AT EAST GRAND BLVD., DETROIT



# New Light *Exceeds* ... Sun's Brilliancy

**M**ODERN projection calls for a light source equaling and in some cases exceeding the brilliancy of the sun itself.

Sound, color, and wide films, with long throws on porous screens now demanded by the modern theatre, have called for a most intense and active program of research and development to keep National Projector Carbons ahead of the requirements of modern projection.

The concentration of large quantities of electrical energy in slender carbons, while keeping the light confined to a point source, represents a most remarkable advance in lighting practice.


The results of this development program have been the production of National Projector Carbons of the highest quality with economies which make carbon costs extremely low in comparison with other important items needed for the successful operation of the theatre.



*National Carbon Company will gladly cooperate with the producer, exhibitor, machine manufacturer or projectionist on any problem involving light. . . .*

**NATIONAL CARBON COMPANY, INC.**

Carbon Sales Division      Cleveland, Ohio

Unit of Union Carbide  and Carbon Corporation

Branch Sales Offices:    New York    Pittsburgh    Chicago    San Francisco



*Here  
it is!*

# RCA PHOTOPHONE

All A.C. Operated  
Special Size Equipment for  
**500 SEAT THEATRES**

*Lease Price*  
**\$1600<sup>00</sup>**

**RCA PHOTOPHONE SPECIAL SIZE EQUIPMENT** for theatres of 500 SEATING CAPACITY and under is now ready! Designed and built to meet the requirements of the smallest theatres . . . compact . . . simple in operation and offered at a price that makes it the salvation of hundreds of houses that heretofore have remained dark or unprofitable with silent pictures or with unsatisfactory sound equipment.

## COMPLETE A-C OPERATION

No Batteries . . . No Motor Generators . . .  
Direct Connection with the A-C Power Line  
. . . making operation extremely simple.  
Built for small projection rooms.

## DESIGNED FOR SMALL THEATRES

Adapted to Simplex, Powers and Kaplan Projectors, operates with 110 volt, 60 cycle and 50 cycle, and 115 volt, D-C Power supply. (Powers and D-C equipments at a slightly higher cost.)

## AN ENGINEERING TRIUMPH!

At Last! The small theatre is given the same opportunity as the super de-luxe house. With confidence the small theatre owner can proudly advertise his RCA PHOTOPHONE SPECIAL SIZE EQUIPMENT, knowing that the box-office attractions of the major studios will be presented with the fidelity of tone and perfection that characterizes RCA PHOTOPHONE performance.

## \$100.00 DOWN, \$25.00 A WEEK!

On the Lease plan, this RCA PHOTOPHONE SPECIAL SIZE EQUIPMENT may be installed on deferred payments as low as \$25.00 per week which includes lease and finance charges, insurance and REGULAR SERVICE during the payment term. *It takes but a very few extra admissions to pay for it and deliver a profit from the first day of operation.*

For further information communicate with nearest branch office or direct to

Commercial Department

**RCA PHOTOPHONE, INC.**  
411 Fifth Avenue • New York City

*A Radio Corporation of America Subsidiary*

15 Branches in Principal Cities of United States and  
authorized Distributors in Foreign Countries.





# Elements of Magnetism and Electricity

By SIEGFRIED S. MEYERS†

## IV

[Note: This series of articles having elicited many inquiries from readers, correspondents desiring additional data on certain sections of the series will confer a favor on both the author and the editor by addressing Mr. Meyers in care of the office of publication rather than direct.—Editor.]

**A** KNOWLEDGE of motors and generators is of tremendous importance to the motion picture projectionist. The projector can be no more efficient than the motor which drives it, and the motor must perform its work quietly and uniformly. In order for the motor to operate efficiently it must be supplied with a constant source of power from the light socket which draws this power from the generator at the power house. While it is beyond the scope of this article to discuss every kind of motor and generator, we shall attempt to lay the groundwork for a working knowledge of direct current motors and generators, so that this information may be subsequently applied to a consideration of the more common alternating current machines.

We know that a coil of wire wrapped around a piece of soft iron constitutes an electromagnet, the strength of which depends directly upon the number of turns of wire, the number of amperes of current flowing through these turns, and the type of core used. A piece of wire is said to possess such properties as will permit lines of magnetic force to pass easily through it. Hence the word "permeability," which means simply the ability to let lines of force pass through it.

Air is said to have a permeability of unity, and other substances have permeabilities which are multiples of the permeability of air. Soft iron may have a permeability of about one thousand times that of air. That is the reason for using soft iron for the core of an electromagnet. The ampere turns determine the magneto-motive force of an electromagnet. In simple terms, the magneto-motive force means the force which a particular electromagnet can exert upon another electromagnet.

### Reluctance

The term *reluctance* is used to express the inability, the reluctance, of certain materials to pass lines of

force through them easily. For example: air has a higher reluctance than soft iron. If an electromagnet is to have great lifting power, the reluctance must be reduced to a minimum. In other words, a horseshoe electromagnet will have great lifting power if its poles are placed closely together. This will permit lines of force which leave the north pole of iron electromagnet to return to its south pole, having meanwhile traveled a short distance through the reluctant air.

Having entered the south pole the lines of force have an easy time passing through the iron to complete the magnetic circuit back to the north pole. The reason for this is because the iron has great permeability (go-thru-ability), and the air has great reluctance.

### Permeability

Permeability of substances is commonly measured by an instrument known as a permeameter. This instrument contains a coil of wire into which the specimen being measured is inserted. When current passes through this solenoid of wire, lines of force leave one end and return through the air to the other end. But, air having high reluctance, a piece of iron (the specimen), placed nearby would concentrate these lines of force and provide an easier path for their return to the other end than would the air.

The more permeable the specimen, the more force one must exert to pull the specimen out of the coil. The

force is measured with the aid of a spring balance which is hooked on to the end of the specimen. As a result of this, the permeability of the specimen simply means the opposition to removal produced by the specimen when a number of lines of force flow through it under the influence of a given strength of current through a coil of wire, thereby making the removal of the core more difficult.

### Flux

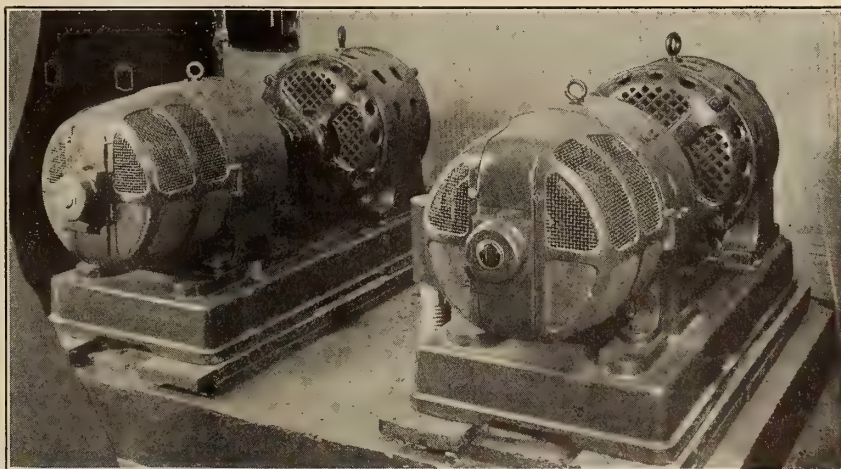
*Flux* means flow. The more lines that flow from one end of a piece of iron to the other, the more flux that body is said to possess. Flux density signifies how densely saturated the specimen may be in a given area. In other words, the more lines of force that pass through one square centimeter, the higher the flux density. An equation which expresses the relation between magneto-motive force, reluctance, and flux, is as follows:

$$\text{M.M.F.} = \text{Flux} \times \text{Resistance}$$

The reluctance of a body varies directly with its length. The longer the magnetic path, the higher the reluctance. Reluctance of a body also varies inversely as to the permeability and cross-sectional area of the specimen. The higher the permeability and the greater the area, the lower is the reluctance or opposition to the passage of the lines of force.

### The D.C. Motor

The *direct current motor* is a natural sequence to a consideration of electromagnetism. The essential components of a D.C. motor are: a field, an armature, a commutator, and a set of brushes. The theory of operation



Typical Paramount-Publix neighborhood theatre power plant installation by Roth Brothers & Co. The Actodectors shown consist of 300-ampere, 85-volt, 1150 r.p.m. compound wound generators direct connected by special couplings to 40 h.p., 220-volt, 1150, 3-phase, 60-cycle special motors. This installation includes automatic motor starters, made up to the specifications of J. H. Goldberg, P.-P. Construction Dept., and known as the Goldberg Special Starters

†Instructor of Physics, Stuyvesant High School, New York City.



of any type of D.C. motor is based upon the law of magnets—namely, opposite magnetic poles attract each other, and like poles repel each other.

The field of a motor is made up of a heavy ring of highly permeable soft iron and has projections toward the hollow center, about which are wound many turns of wire. These turns are wound in such manner as will create a north pole on one projection, a south pole on the next, and so forth.

#### The Four-Pole Motor

A *four-pole machine* naturally has two north poles and two south poles on the field, which is commonly called the *stator*. On the rotor many coils are wound around slots which are cut in the soft iron core of this armature. The soft iron is made of thin layers of iron to reduce losses known as *eddy currents*. These currents travel throughout the iron and liberate heat, which is a loss of energy. Now, each of these armature coils are connected to copper segments which are insulated from one another, and a pair of brushes rest upon this commutator. When a source of direct current is applied to the field magnets and to the armature coils simultaneously, the law of magnets operates and the armature rotates in such direction as will permit opposite poles of field and armature to face each other. But, just as these poles are about to arrive at such a position which will maintain the armature stationary, the brushes will have led the current through the commutator into another pair of armature coils, which will produce a similar turning tendency. This turning tendency is called *torque*.

#### Torque

The torque developed in a D.C. motor depends upon the usual factors. In the first place, the motor may run either clockwise or counter-clockwise, the direction being determined by the method employed in connecting the field to the armature. If either the field or the armature connections are reversed, the direction of rotation will naturally be reversed. But if both the armature and the field are reversed simultaneously, there will be no change in the direction of rotation.

The forces of repulsion and attraction among the poles of the rotor and the stator will naturally depend upon the strength of these magnets. For this reason the armature is usually wound with heavy wire so that its low resistance will permit a heavy current to flow, thereby increasing the magnetomotive force. The torque also depends upon the flux between the rotor and the stator. The smaller the reluctance, the greater the flux, hence it is desirable that the armature have very little mechanical clearance from the stator, so that the air gap, having high reluctance, will be reduced to a minimum. Last, but not

least, the torque depends upon the constants of the machine, namely, the number of turns of wire, and the number of poles on the field. A motor having many conductors will have a strong torque.

#### Counter Electromotive Force

Every motor is essentially a generator. Whenever a coil of wire moves in a magnetic field, as in the case of a rotor, a voltage is induced in this rotor in such direction as to oppose the impressed voltage. Hence, this counter-voltage, opposing the impressed voltage, reduces the amount of voltage which is left to drive current through the armature. The beginner in these matters would naturally conclude that counter-voltage is an undesirable factor, but after a little reflection he will see how beneficial is this counter-electromotive force.

The amount of counter-voltage generated depends upon various factors: first, the motor, which behaves like a generator, will deliver a voltage which depends directly upon the number of turns on the armature, the number of poles, the strength of the flux, and the speed of the rotor. Most important of all these factors is the speed of the rotor.

#### Starting the Motor

At starting, the rotor is stationary. Hence no counter-voltage is being generated and the full line voltage of 120 volts is impressed across the armature, the resistance of which is hardly greater than one-half ohm. This means then, according to Ohm's Law, that a current of 240 amperes will flow through the armature and burn it out. To prevent this a starting rheostat is employed which has a series of taps so arranged that the ad-

ditional resistance will reduce the current in the armature to a safe value.

Although the current is considerably reduced by this rheostat, the magnetomotive force will be sufficient to develop a torque. As the motor gathers speed the counter-voltage builds up and opposes the impressed voltage. The resulting voltage, being lowered, is unable to drive a dangerous amount of current through the armature, thereby permitting the operator to advance a tap, which reduces resistance, raises the current, increases the torque and also the counter-voltage. This process continues until the motor is running at full speed, developing its maximum counter-voltage and enabling the resultant voltage to drive a minimum of current through the armature.

#### Variable Motor Speed

It is often necessary to vary the speed of a D.C. motor. Some prefer to control the speed of the motor by means of the starting rheostat. This is undesirable, because a considerable amount of power is wasted in heating the resistances. Another difficulty may be the burning-out of these resistances because of the heat. The usual way to vary the speed of a D.C. motor is to insert a rheostat in series with the field of the motor.

To the beginner it would seem that an increase in the resistance of this field rheostat would tend to slow down the motor, because it does not permit as much current to flow through the field magnets. But this is not the case. When resistance is increased, the field is said to be weakened, and the motor speeds up; when the field is strengthened, the motor slows

---

## N. T. S. Lowers Prices on Many Staple Supplies

---

National Theatre Supply Company has announced a substantial reduction in prices on many staple supply items, effective July 1st next. The decrease in cost to the consumer ranges from 10% to 33 1/3%, the reductions applying to standard supply items such as are used regularly in all theatres.

It is emphasized by the company officials that the immediate lowering of costs to the consumer is not a temporary slash in prices to remain effective only for a limited period but is in reality a definite move for a downward revision in prices of theatre supplies, brought about by manufacturing and distributing economies which have been effected, and in keeping with the company's often expressed policy to lower costs whenever and wherever possible.

When interviewed on the subject, Mr. J. I. Roberts, sales manager for

the company, had this to say: "Our sales during the past six months have held up remarkably well. In a majority of our branches a marked increase in sales has been shown. Such economies have been effected in both manufacturing and distributing costs that, with a substantial general increase in volume of business, it is now possible for us to pass along to the theatre the benefits of permanently lower prices on a number of staple supplies and accessories."

Concurrent with this move for adjustment in consumer cost, the company also announces the completion of distributing arrangements on several new lines of theatre equipment the demand for which, they claim, will materially augment their sales volume and thus tend to make further price revisions possible.

---



down. Does this not seem strange?

The following will explain this paradox: when the field is weakened, the flux is reduced, and the counter-voltage, which depends on the flux, is reduced. This means that the impressed voltage will not meet with as much opposition as before and consequently can drive more current through the armature. The more current flowing through the armature, the greater is the torque, or turning tendency, and since the mechanical load on the motor still is the same, the speed is increased.

On the other hand, if resistance in the field circuit is reduced, the counter-voltage increases, which opposes the impressed voltage. The resultant current would then drive less current through the armature, which reduces the torque. Since the motor would still be driving the same mechanical load, a reduction of its torque would result in a reduction of its speed.

creased, or slowed down, by reducing resistance and strengthening the field. Hence, our conclusion is that the speed of a shunt D.C. motor may be increased by increasing resistance or weakening the field, and may be de-

#### Types of D.C. Motors

There are various types of D.C. motors, each suited to a particular purpose. These types of motors differ among themselves in the method of connecting the field to the armature. The shunt motor has the field and armature connected in parallel. The series motor has both windings connected in series. The compound motor has an additional field winding which is connected in series with the other two windings which are connected in parallel. This last-named type has the advantage of constant speed under all loads.

(To be continued)

## A New Method of Splicing Sound Film

**A**N improved system of treating the sound track at splices—a system eliminating messy methods of painting and at the same time successfully silencing splice noise—has come out of the Eastman Kodak Research Laboratories and onto the market. The new method was described to the industry more than a year ago<sup>1</sup>, but production of the necessary “bloomer patches” and the simple block for applying them has only recently made it applicable in processing laboratories and projection rooms.

The introduction of this equipment came as a result of many requests that followed the announcement of the new patching process. The wide interest shown indicated to the Kodak Company that expenditures involved in acquiring tools to make the patchers and the patches would be justified.

The patching system obviates a condition in which imperfect painting of the sound track at splices frequently caused noises as objectionable as the extraneous sounds made by the reproducing system when an untreated patch went through. The older method caused more dissatisfaction in projection rooms than in laboratories, where skilled workers painting the sound track at hundreds of splices a day attained proficiency in the process. Even in the laboratories, however, it is believed that greater speed, together with assured accuracy, can be gained by use of the new patching process.

Reference to a report<sup>1</sup> of the development work in connection with this new method of splicing sound film

reveals some interesting data as to the why and how of the process.

#### The Patching Material

After considerable experimentation with various types of stencils and patches, the film patch material finally adopted consisted of clear film base, emulsion coated, and rendered opaque by exposure and development. A film of minimum thickness (0.003 inch), was chosen so as to conform readily to the irregular surface of the splice and prevent the splice from becoming too thick and stiff.

This type of splice was very successful. The patches were tested by applying them over splices in a positive film which was then run through a projection machine until the film broke down completely. The patches were intact up to the time when the perforations commenced to fracture at the corners.

#### The Splicing Operation

The patch is applied with the aid of a registration block which consists of a bed plate fitted with registration pins and a pressure plate fitted with a rubber pressure plate. The plate is hinged to the bed and the rubber pressure surface is cut out so that it fits closely around the pins.

The motion picture film is placed on the registration block with the sup-

port side up and that side of the strip which bears the sound record in engagement with the four pins. The splice is placed at or near the center of the block. The pins fit the perforations so closely that pressure clips for holding the film in place are unnecessary. When the film is in position on the block the patch is picked up and held at one end by means of tweezers or an attached tab while cement is applied to the side which is to come in contact with the film strip. The cement application is accomplished by a single stroke of a soft cementing brush of medium size. The patch is placed immediately on the registration pins, the pressure plate brought down, and held in position for about five seconds.

The patch which proved most successful was so made that it covered the entire width of the sound track completely and extended as far as possible toward the center of the film strip without entering the picture area. Some of the factors which entered into consideration of the best design for the patch are discussed below.

#### Design of Patch

As previously mentioned, the patch or a “paint-out” performs its function by masking off an area of sound track of varying width so as to reduce the total transmission of the area illuminated by the slit in the reproducer at a rate which is insufficiently rapid to cause the recorder to generate an audible sound, and then, when the splice is past, uncovering the track in a like manner.

The reproducers now in use are capable of generating sounds of a frequency not less than 20 to 50 cycles per second. Therefore, if the splice is to be designed so that it will cause no noise of itself, it should vary the transmission as it would be varied by a signal whose frequency is not more than 20 cycles. Such a signal would be represented by a patch whose contour would be described by a sine curve of an amplitude corresponding to full modulation. Its length for 20 cycles would be:

$$\frac{18 \text{ inches}}{20} = 0.9 \text{ inch.}$$

Now, it might be argued that this length causes a noticeable discontinuity in the sound. This is not so serious as it might seem. A patch having straight instead of curved sides has been considered because it is much more easily made, especially if it is to be cut by hand. If the patch is shorter (about one-half this length, as has been recommended), the harmonics introduced by using a straight edge for the cut-off as an approximation for an edge of curved contour, are of a higher frequency and therefore more prominent. Also, the fun-

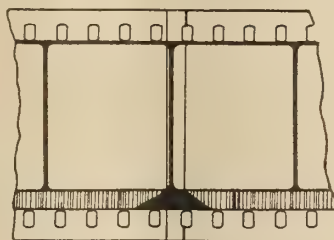


Fig. 1. A typical paint-out

<sup>1</sup>"A New Method of Blocking Out Splices in Sound Film," by J. I. Crabtree and C. E. Ives, *Motion Picture Projectionist*, Vol. 3, No. 7, May, 1930.



damental is well within the range of the producer.

### Tests on Patch Noise

The following tests were made with a view to arriving at a design which would be a compromise between one which would be audible and one which would obscure too much of the sound record.

A number of patches having dimensions indicated in Fig. 2 as shown in Table 1 were made and applied to (1) an oscillator record of low modulation (frequency 540 cycles); (2) a strip of clear film of density about 0.1; and (3) a strip of film flashed and developed to produce a uniform density of about 0.7. In each of these films two splices were made with 5 feet of film between them and then 17 feet were skipped before another splice was made. The first splice was left bare, the second was covered with the patch, and then 5 feet beyond the second splice a patch was mounted at a point where there was no splice. In this way each of the patches in the table was prepared for test. In order not to have any bad corners it is desirable to avoid cutting across perforations so that the choice of lengths is limited.

The tests were made by running these strips through a standard type of reproducer operated at a normal gain setting. The modulation of the oscillator record was such as to produce at this gain setting a volume corresponding to normal speech. The noise from a well made splice, made with a widely used mechanical splicing machine, was plainly audible.

In general, the noise produced by a plain splice was least noticeable in the oscillator records, more noticeable in the 0.7 density, and most in the 0.1 density film. The patch number 1 produced a plainly audible sound, number 2 was somewhat less loud, and numbers 3 and 4 were only just audible on the 0.1 density film and apparently about equally effective.

Numbers 3 and 4 were noticeable because of their obscuring the oscillator record for a perceptible duration of time. Number 2 did not cause a noticeable interruption. The best length of patch is therefore indicated by number 2 or 3, number 1 being noisy of itself and number 4 interfering with the record for an unnecessarily long period of time. With reproducing systems which are capable of reaching 20 to 30 cycles it is necessary to use the number 3 size, because

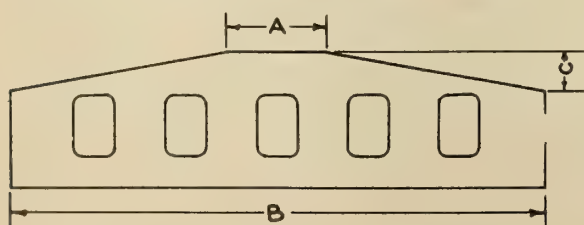


TABLE I  
*Experimental Patch Dimensions (See Fig. 2)*

Patch No.	A	B	C
1	0.09 in.	0.29 in.	0.10-0.12 in.
2	0.1875 in.	0.65 in.	0.10-0.12 in.
3	0.1875 in.	1.00 in.	0.10-0.12 in.
4	0.1875 in.	1.40 in.	0.10-0.12 in.

the smaller patches make an offensively loud sound.

The patch should cover the splice at the widest point. This condition is satisfactorily fulfilled when the sound track is completely obscured for a distance equal to 0.098 inch each way of the center line of the central perforation (Fig. 2). This allows for the standard "full-hole" splice. It is advisable to have the patch extend inward almost to the picture frame. Then there is no danger of leaving part of the splice uncovered through an inaccuracy in mounting the patch.

A total length of 1.00 inch was found best because of these considera-

tions. A spliced sound record film fitted with the patch is shown in Fig. 5. The sloping sides have a length along the sound track of, in this case,  $1.00 - 0.1875 = 0.8125$  inch, or 0.4102 inch each. This is slightly shorter than that for the one-half wave length at 20 cycles (0.45), and corresponds to a frequency of about 22 cycles.

The patch is very much easier to handle if it is supplied with a finger tab, consisting of a strip of stiff cloth attached with a non-permanent adhesive. The tab is readily removed in the same manner as ordinary surgical adhesive tape.

## Projection Operating and Maintenance Economy

By HARRY RUBIN†

ECONOMIES can be effected in the projection room without sacrificing the quality of the performance. Many opportunities for saving offer themselves, particularly in the matter of carbon consumption, electric current, batteries, mechanical equipment, and the use of amplifier tubes. Projector carbons are a big item of expense to each theatre. By careful handling to avoid breakage and by giving thought to the time required for various reels, carbon wastage can be reduced to a minimum.

By using carbon savers which have been tested and approved for use for the 9 mm. x 20" and the 13.6 x 20" carbons, the waste can be further reduced to the point where only two inch stubs need be thrown away. The 9 mm. and 13.6 mm. carbons are the most costly of all sizes used by theatres and considerable money can be saved by the use of carbon savers on these two sizes.

### Carbon Burning Rate

Projectionists should check the burning rate of carbons for a period of fifteen minutes and determine what amount is consumed in this period. From this information it is easily de-

termined in advance what amount will be consumed for each individual reel of film according to its length. Thus, the stubs of carbons can be graded according to burning length in minutes and the proper length of carbon stub selected accordingly for each reel.

The usual burning rate for the 9 mm. size is  $5\frac{3}{4}$  minutes to the inch when used at 70 amperes; for the 13.6 mm. size, the burning rate is 4 minutes to the inch at 125 amperes. If carbons burn faster, it indicates that too much current is used.

The minimum carbon stub without a carbon saver using a Reflector High Intensity or H. C. type of lamp is four inches; using the F. R. lamp, the stub is  $4\frac{3}{4}$  inches. Carbon savers allow  $11\frac{1}{2}$  minutes of extra burning time for the 9 mm. size; 11 minutes for 13.6 mm. size when used in F. R. type; and 8 minutes when used in H. C. type of lamp.

The carbon saver for the 9 mm. size is made by Golde Manufacturing Co., Chicago, Ill., and consists of a tube having a tapered right-hand thread in end, into which the burned end of carbon is inserted and threaded in firmly to resist loosening, if carbon is manipulated in reverse direction in lamp. In addition to tapered-threaded tube, there is a retaining screw which can be inserted through the tube and into the core of the carbon. Usually, it is unnecessary to use this screw.

Precaution is necessary to insure alignment of carbon and tube. Alignment is assured if carbon and tube

†Supervisor of Projection, Publix Theatres Corp.

Fig. 2.  
Dimensioned  
sketch of  
patch



are rolled on a flat surface before final tightening up.

#### Carbon Saver Good Investment

The cost of the carbon saver for the 9 mm. size is \$5.00 for a pair of tubes. For the 13.6 mm size of carbon, the saver is made by Blue Seal Products Co., Brooklyn, N. Y. and costs \$15.00. This saver consists of one threading die, one die holder and two threaded tubes, having a thread at each end. Right-hand thread is used for H. C. type of lamp, and the left-hand thread for F. R. type of lamp. Right- or left-hand thread should be specified when ordering.

Carbon savers may also be secured from Best Devices Co. of Cleveland.

To use this carbon saver, the burned end of the carbon is inserted in the die holder and the carbon rotated so as to cut a thread in the carbon. The carbon is then turned out of the die and inserted in threaded tube and is then ready for use.

Carbon savers pay for themselves in a short time and they last for a considerable period.

#### Electric Current Savings

Projectionists can effect a saving in carbon and electric current used by determining the time required to burn in a crater or to allow for the quieting of the arc and by using this knowledge in lighting the second arc, prior to each change-over. By following this procedure, the time when both arcs are in operation is reduced to a minimum.

Attention given to the storage batteries in the matter of maintaining proper level of electrolyte and the avoidance of over-charging or over-discharging will result in a full, useful life and, conversely, a lack of such attention will result in a greatly shortened life with consequent waste and expense. Failure to keep battery plates covered with electrolyte results in permanent injury to that portion of the plates which are left exposed.

Over-charging results in the rapid formation of sediment which soon short-circuits the cells and is also wasteful in the use of current. When it is frequently necessary to add much water to the battery, it may be taken as an indication that the batteries are being over-charged.

#### Proper Lubrication

Regular and frequent lubrication has a direct relation to the life of the projector mechanism. Oil should be sparingly applied to bearings and any excess wiped off before projecting film. Absorbent pads should be changed frequently, as this will prevent oil soaking into the film amplifier and causing damage to insulation of wires and also prevent the accumulation of oil on the film.

Maintaining the proper clearances of pad rollers, fire valve rollers and film trap, the proper tension on pres-

sure pads and takeup will (1) extend the life of the mechanism parts; (2) lessen the liability to film fires; (3) be conducive to best screen results; (4) reduce wear and injury to the film, thereby effecting a tremendous saving which, although not on the theatre records, nevertheless is of the utmost importance to the industry.

Avoiding the use of bent reels will prevent damage to film while in the theatre. Inspection and cleaning of the mechanism after each reel will prevent accumulations of emulsion causing damage to subsequent reels. Inspection of film after each run will detect loose splices, scratches, or other defects which may have developed during the last run of film.

#### Life of Tubes and Parts

Careful handling of amplifiers in allowing sufficient warming-up time for tubes, prevention of excessive current in tubes, and, when closing down, opening high voltage circuits before low voltage ones will prolong life of tubes.

A careful checking of spare parts at frequent stated periods will insure against a sudden shortage of vital equipment or supplies, and will eliminate the expense of special ordering or shipping. Using manufacturer's code number to designate parts ordered will prevent receiving wrong material with resultant expense for re-shipping and the annoyance of delay.

Duplicates of parts subject to sudden breakage should be readily available in case of emergency. Using the stage horns at high volume behind closed front curtains invites injury to the horn receivers. Repairs cost \$20.00 per receiver. Careful projectionists guard against this trouble by keeping the volume within limits of the receiver.

#### Novel English Screen Gains Favor in First Demonstration

A NEW screen with novel features has recently been demonstrated in England by Stereoscreens, Ltd. The specimen screen shown during this demonstration measured 22 ft., 6 in. by 17 ft., 6 in., according to a report of the test appearing in the English trade press, and consisted of a special fabric on which were mounted about 460,000 small lenses, semi-parabolic in shape. The lenses measured about  $\frac{3}{8}$  in. in diameter and were attached to the screen by a cement with a high light-reflecting value. The spaces between the lenses were cut away for sound, where necessary.

#### Has Mat Appearance

Although the screen is fairly heavy, there are no special difficulties in suspension. The lens pattern gives the screen a regular matt appearance when viewed closely; but this effect disappears at about 15 ft. distance,

and even while visible is rather pleasing than otherwise.

#### Impressive Demonstration

The demonstration took place in a full-sized theatre, half of the picture being shown on the regular screen and half on the Stereoscreen. The comparison was startling. Whereas the picture on the regular screen (which was quite clean), showed dirty brownish whites and deep sepia "blacks," the other half was startlingly luminous, gave high lights of a bright blue white and jet black low tones. This result was most noticeable in connection with pictures taken out of doors by natural lighting and the added realism given to the picture was impressive.

Although the sponsors do not claim that this new screen is in any real sense "stereoscopic," it does improve the range of gradations between the blacks and the high lights and in that way create a real feeling of modelling and roundness.

#### Great Increase in Light

There is a tremendous increase in the brilliance of the picture, as might be expected, but this increase is of a restful quality, the effect being that of a picture softly glowing with its own light. There was no discoverable trace of distortion from any part of the house, and, in fact, the company claims that the Stereoscreen is a cure for that evil.

There are some very curious optical principles involved, especially from angular viewpoints; but the practical results are entirely satisfactory and the great increase in screen illumination and colour value is undeniable. With colour films there is said to be a remarkable increase in the brilliance and softness of the colours, but no colour film was projected. The screens are not sold outright, but are to be rented at a very low figure.

A screen of about the same size is in experimental use this week at the Gloria Palast, Berlin, and the results have been enthusiastically endorsed by the UFA people.

#### Results of Lumeter Tests

Tests by a Holophane lumeter show that the increase in reflected light is very real and not imaginary. Curiously enough, the maximum amount of reflected light is not found in the optimum position. For instance, if the foot candles measured at an angle of 5 deg. from the centre lines are 975, the illumination steadily increases as the angle of vision until at an angle of 40 degrees the figure is 1,600 foot candles. At 55 degrees the Lumeter showed 1,650 foot candles, from which point it begins to fall away—at 60 degrees it was 1,300.



# Properties of Low Intensity Reflecting Arc Projector Carbons \*

D. B. JOY AND A. C. DOWNES\*\*

SEVERAL years ago a paper<sup>1</sup> was presented before the S. M. P. E. summarizing the characteristics of the large size, low intensity carbons used at that time for light projection in theatres. Since then the low intensity lamps using large size carbons have been almost entirely replaced by the low intensity reflecting arc lamps, the high intensity reflecting arc lamps, and the high intensity condenser type lamps. In the last few years the need for more light even in the smaller theatres has been augmented by various factors such as the use of perforated sound screens, colored films, and the demand for a higher level of general illumination.

Carbon manufacturers have endeavored to aid the situation in the smaller theatres by recently developing low intensity reflecting arc carbons which carry higher currents than those previously available. It is believed that data on the characteristics of these carbons and their application to projection problems may suggest ways to improve still further the illumination of the screen.

The current carrying capacities of these carbons are given in Table I. Approximately 2 amperes have been allowed as a factor of safety between the maximum recommended current

TABLE I  
Current Ratings of S. R. A. Positive Carbons

Carbon Diameter	Current above Which		
	Minimum Recommend Current	Maximum Recommended Current	There Is Constant Sputtering
10 mm.	21	24	25
12 "	28	32	34
13 "	32	42	44
14 "	42	52	55

and the extreme upper limit of the carbons. Data on the 10 and 14 mm. carbons have been included although there has up to this time been no active demand by the industry for these sizes. If the carbons are burned above their maximum current, the light will be unsteady and there will be no appreciable gain in candle-power. If the carbons are burned below the minimum current the efficiency of light production is decreased

TABLE II  
Change in Crater Diameter with Current S. R. A. Positive Carbons

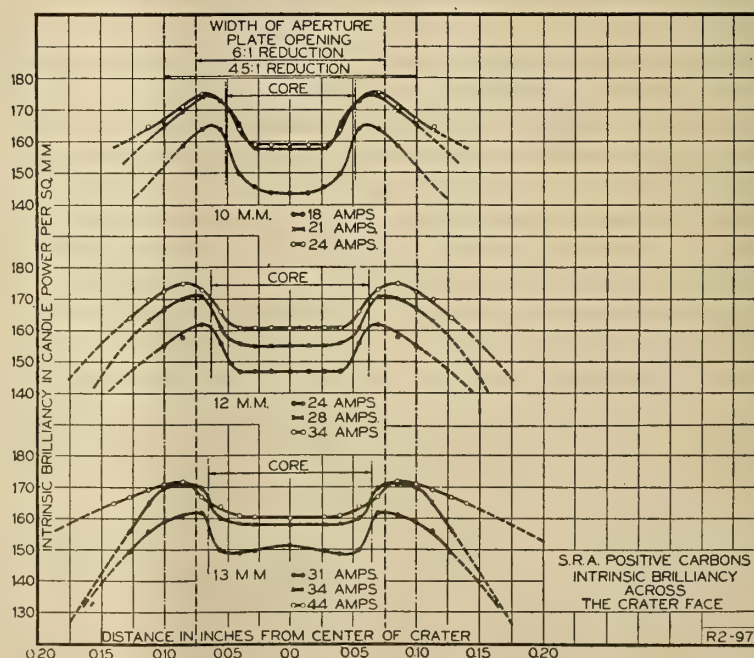
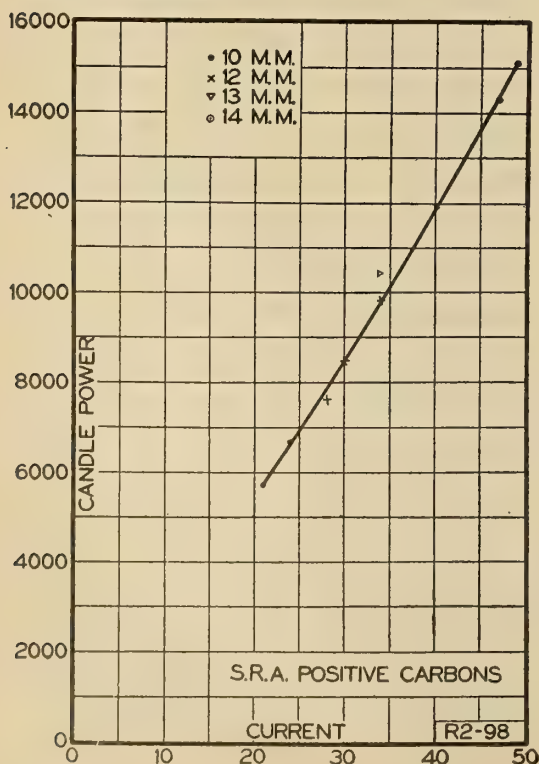
Carbon Diameter	Current	Crater Diameter in Inches
10 mm.	21	.262
10 "	24	.278
12 "	28	.311
12 "	31	.325
12 "	34	.344
13 "	34	.347
13 "	40	.378
13 "	44	.392
14 "	44	.404
14 "	50	.419
14 "	55	.432

and the arc tends to become unsteady because the crater area is too small to sufficiently cover the end of the carbon.

It is the light from the crater of the positive carbon which is of value. The light from the negative carbon and arc stream is only approximately 10 per cent of the total light and cannot be utilized for projection purposes. The diameter of the positive crater increases with increasing current. The data in Table II illustrate the change for these particular carbons and correspond to similar values in the literature.<sup>1,2</sup>

The action of the direct current on the crater of the positive carbon heats it to approximately 4000°K., the vaporizing temperature of carbon. This gives the crater an intrinsic brilliancy of 130 to 180 candles per square millimeter, which is exceeded only by the crater of a high intensity carbon.

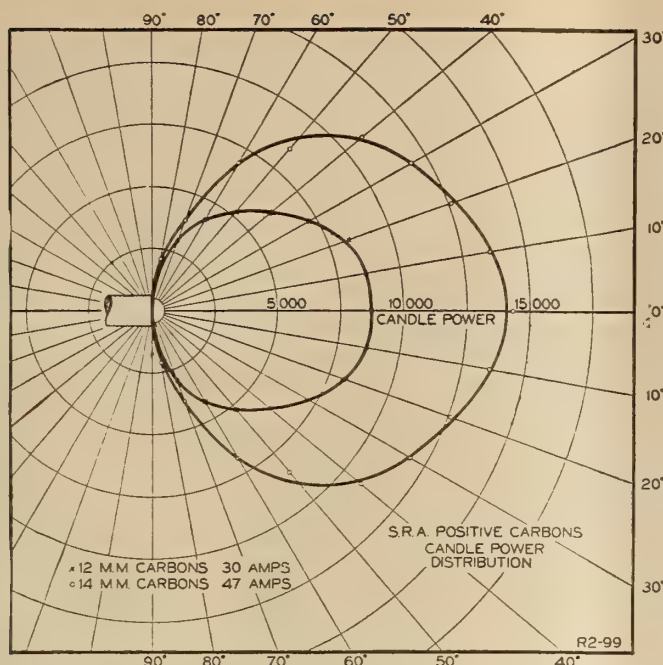
The variation in intrinsic brilliancy of the positive crater was determined by the method used by Benford.<sup>3</sup> As shown in Fig. 1, the intrinsic brilliancy is uniform on the core, rises sharply to a maximum on the shell just outside the core, and decreases again near the edge of the crater. If the carbon were solid instead of cored, there would be no dip in the intrinsic brilliancy at the center of the crater. However, the core is necessary to furnish arc-supporting materi-



Above: Fig. 1. Variation of intrinsic brilliancy of the positive crater

Left: Fig. 2. Variation of candle-power of the crater with respect to the current





Above: Fig. 3. Polar candle-power curves showing light distribution about the crater. Right: Fig. 4. Change in light on screen with respect to movement of positive carbon along the reflector axis

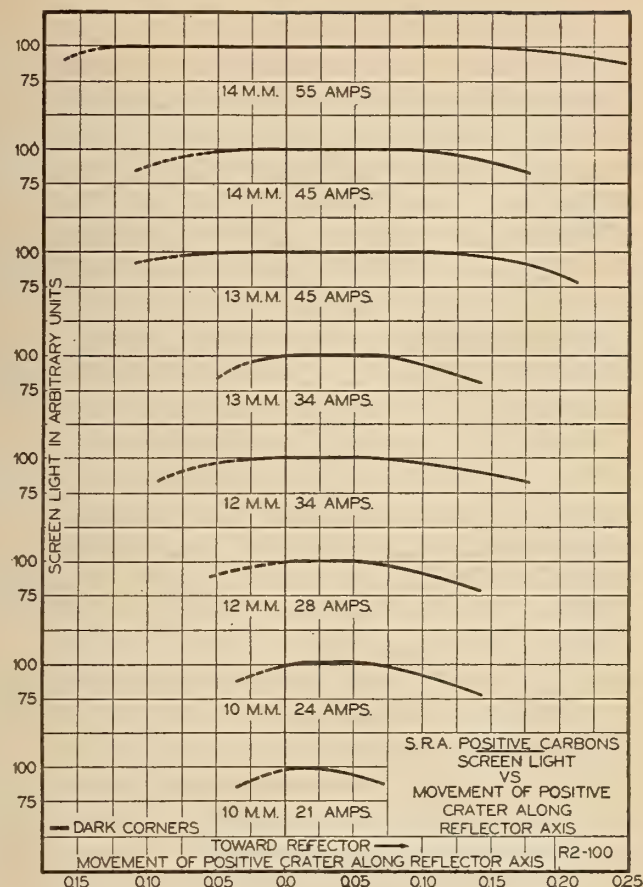
als and to maintain the crater position constant with respect to the carbon. Without it, the current would have to be reduced materially and the crater would travel around the end of the carbon and would result in a very unsteady light on the screen.

It should be noted that above a certain current for each size carbon there is practically no increase in the intrinsic brilliancy of the central part of the crater—merely an increase in crater size and intrinsic brilliancy near the edges of the crater. It is also evident that after this critical current has been reached the intrinsic brilliancy is the same for the central portion of the crater on a 10 mm. carbon as for the 13 mm. carbon. This important characteristic will be referred to later in relation to the optical system. The approximate current at which the central portion of the crater reaches its maximum is the minimum recommended current in Table I. The values of intrinsic brilliancy near the edge of the crater, in dashed lines, were extrapolated from the actual measurements made on the rest of the crater.

The candle-power of the crater could be calculated from these intrinsic brilliancy curves, but the values shown in Fig. 2 were obtained by the method<sup>4</sup> of measurement previously used for high intensity carbons. These values check within the limits of experimental error with values calculated from the intrinsic brilliancy curves.

#### Distribution About Crater

Of more importance for projection than the candle-power directly in front of the crater is the light distribution about the crater. This is obtained by the same method<sup>4</sup> and polar candle-power curves for two currents are given in Fig. 3. The polar curves for other currents and carbon sizes would be similar in shape and proportional to the candle-power values in Fig. 2. These polar curves are misleading if they are not carefully analyzed. A better method of expressing the same thing is to compute the quantity of light in each an-



gular segment. These values as well as the total quantity of light and the accumulative percentages are given in Table III.

The optical systems used in the present low intensity reflecting arc lamps have been described by Bassett<sup>5</sup> and Stark.<sup>6</sup> Briefly, the systems commonly employed use a parabolic reflector with a condensing lens or an elliptical reflector alone. Irrespective of the system used, the light pick-up from the arc has usually been a cone of 120-degree opening which, according to Table III, would include approximately 75 per cent of the light from the positive crater.

The light gathered by the reflector is focused on the aperture plate in the form (neglecting spherical aberration), of an image of the crater. The magnification of the system is approximately 6 to 1. Under these conditions it is theoretically correct that the optical system is saturated when

TABLE III: S. R. A. Positive Carbons Angular Light Distribution

12 Millimeter Carbon at 30 Amperes					14 Millimeter Carbon at 47 Amperes				
Angle	Average	Lumens Light Flux in Various Zones	Per Cent of Total Lumens	Accumulative Per Cent of Total Lumens	Angle	Average	Lumens Light Flux in Various Zones	Per Cent of Total Lumens	Accumulative Per Cent of Total Lumens
0-10	8695	825	3	3	0-10	13,950	1320	3	3
10-20	8360	2360	9	12	10-20	13,100	3700	9	12
20-30	7590	3520	13	25	20-30	12,200	5600	14	26
30-40	6670	4180	16	41	30-40	11,350	7130	17	43
40-50	5730	4430	17	58	40-50	9650	7460	18	61
50-60	4730	4230	16	74	50-60	7630	6850	16	77
60-70	3600	3570	14	88	60-70	5340	5300	13	90
70-80	2220	2260	9	97	70-80	2930	3100	7	97
80-90	720	780	3	100	80-90	1015	1110	3	100
26,155 (Total Lumens)					41,570 (Total Lumens)				



TABLE IV

*S. R. A. Positive Carbons Extent of Movement of Positive Crater along Axis without Materially Decreasing Screen Light*

Total Allowable Movement in Inches along Axis for a Change of More than 5 Per Cent in

Carbon Diameter	Current	Screen Illumination
10 mm.	21	.06
10 "	24	.10
12 "	28	.10
12 "	34	.15
13 "	34	.11
13 "	45	.21
14 "	45	.18
14 "	55	.34

a current of 21 amperes is used on the proper size carbon and that higher currents merely give more light to be absorbed or reflected from the aperture plate.

It can be seen that this is plausible by a reconsideration of Fig. 1. In this figure, instead of projecting the crater face onto the aperture plate, the width of the aperture plate opening with the proper reduction for 6 to 1 magnification has been projected back onto the crater. The values of intrinsic brilliancy for the portions of the craters within the aperture plate width indicate that no more light could be expected to go through the aperture plate from a 13 mm. carbon at 44 amperes than from a 10 mm. carbon at 21 amperes. They also show that if the carbon is run below its rating, for example, 31 amperes on a 13 mm. carbon or 24 amperes on a 12 mm. carbon, there will be less light through the aperture plate opening because of the lower intrinsic brilliancy of the middle portion of the crater.

However, there are very important reasons for not using for ordinary theatre projection the smallest size carbons or the lowest current theoretically possible. The total light and the uniformity of the light on the screen depend largely on the position of the positive crater with respect to the focal point of the mirror. In practical projection it is very difficult to hold the positive crater within 0.025 inch of the correct focal point. This accuracy would be necessary to obtain the maximum screen light from a 10 mm. carbon at 21 amperes with a mirror arc system in common use.

The change in the light on the screen with the movement of the positive carbon along the axis of the reflector of a typical optical system for various currents and sizes of carbons is shown in Fig. 4 and Table IV. The movement of the crater away from the axis for the various carbon sizes and currents without a material decrease in the screen light was not measured, but is illustrated in Fig. 1 and Fig. 5, where the aperture plate opening for a 6 to 1 magnification is compared with the crater diameters

and intrinsic brilliancies. These data show the disadvantage of using a carbon below, or even near, its minimum current capacity rather than the next lowest size carbon near its maximum current capacity.

From these considerations, the use of a 15 mm. carbon at 40 amperes appears to be amply justified to guarantee uniformity of screen illumination. Even with this carbon and current, the positive crater must be held within 0.07 inch of the focal point of the reflector to maintain the screen illumination within 5 per cent of the possible maximum.

The limitations of the present low intensity mirror arc optical systems have been clearly defined by Stark.<sup>6</sup> At that time the fastest projection lens would pass a cone of light only approximately 20 degrees in total angular diameter. This practically fixed the magnification ratio of the reflector system at 6 to 1 and the angle of light taken by the reflector from the crater at 120 degrees. If the angle of the reflector were increased to take a greater angle of light from the crater, this additional light could not be passed by the projection lens. If the magnification were reduced there would be no advantage because the projection lens could pass only a correspondingly smaller angle of the light picked up by the reflector.

Recently, however, projection lenses have been made available which will pass a cone of light approximately 29 degrees in total angular diameter. Such a lens will allow the magnification to be reduced from 6 to 4.5 and still take all the light from a reflector with a gathering angle of 120 degrees

about the positive crater. This change would merely require a new reflector (possibly slightly larger in diameter and further from the arc to allow sufficient room in front of the lamp) of the proper magnification, the new type projection lens, and the proper carbons and current. The light on the screen would theoretically be increased inversely as the square of the magnification or approximately 75 per cent over that now available.

A comparison of the relative sizes of the crater and aperture plate with the two magnifications is given in Fig. 1 and Fig. 5. It appears that an increase of only 10 amperes in the arc current over that used for the 6 to 1 magnification would give the corresponding flexibility and evenness of screen illumination to the 4.5 to 1 magnification. For example a 14 mm. carbon at 50 amperes with the new magnification of 4.5 to 1 would have the same allowable movement around the focal point of the reflector for good screen illumination as a 13 mm. carbon at 40 amperes with the 6 to 1 magnification.

## References

- <sup>1</sup>Mott, W. R., and Kunzmann, W. C.: "Efficiency in Carbon Arc Projection," *Trans. Soc. Mot. Pic. Eng.*, No. 16 (1923), p. 143.
- <sup>2</sup>"Illumination Data for Low Intensity Arcs," *Motion Picture News* (April 6, 1921), p. 1097.
- <sup>3</sup>Benford, Frank: "The High Intensity Arc," *Trans. Soc. Mot. Pic. Eng.*, No. 24 (1926), p. 71.
- <sup>4</sup>Joy B. D., and Downes, A. C.: "Characteristics of High Intensity Arcs," *J. Soc. Mot. Pic. Eng.*, No. 14 (March, 1930), p. 291.
- <sup>5</sup>Bassett, P. R.: "The Progress of Arc Projection Efficiency," *Trans. Soc. Mot. Pic. Eng.*, No. 18 (1924), p. 24.
- <sup>6</sup>Stark, Sander: "Reflector Arc Projection—Some Limitations and Possibilities in Theory and Practice," *Trans. Soc. Mot. Pic. Eng.*, No. 23 (1926), p. 94.

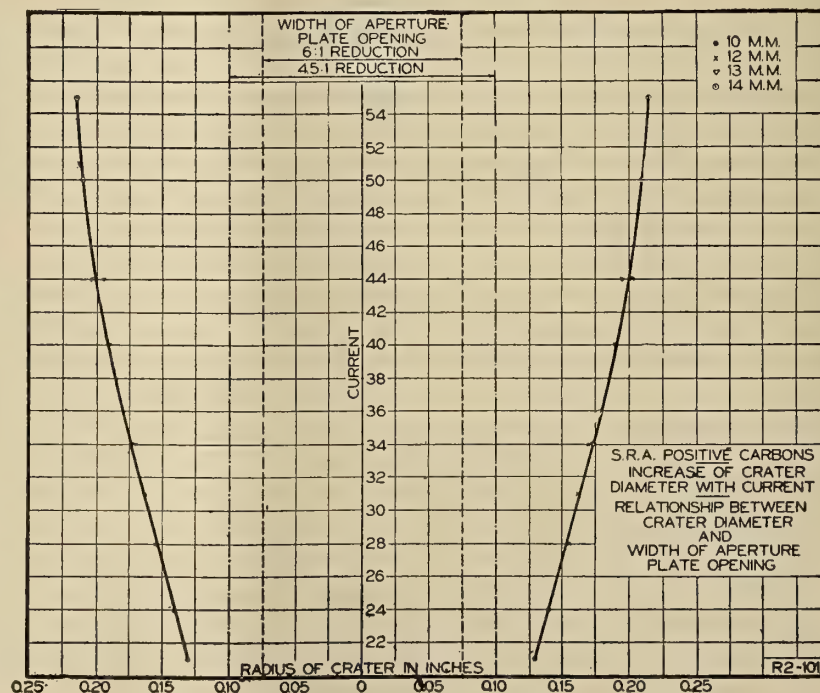


Fig. 5. Relation between crater radius and current



# Projection the Outstanding Feature of S.M.P.E. Meeting

*The information appended hereto is a communication from Herbert Griffin who acted as observer for MOTION PICTURE PROJECTIONIST at the recent 29th Convention of the Society of Motion Picture Engineers in Hollywood. Mr. Griffin, who is a member of the S. M. P. E. Projection Practice Committee and also of the Technical Co-ordination Committee of the Projection Advisory Council, contributes herewith a report which, reflecting the increasing interest of the Society in projection, should prove of great interest to all projectionists.—Editor.*

**Y**OU asked me to give you a report covering the S. M. P. E. Convention in Hollywood. I presume that what you desire most is to hear just how much consideration was given to the science of motion picture projection and sound reproduction in the theatre. The recent convention in Hollywood was, to my mind, the most successful one ever held by the Society. I am a firm believer that the convention should be held as often as possible in the East, although Hollywood is undoubtedly an ideal place to hold a meeting from time to time.

## Projection Features Meeting

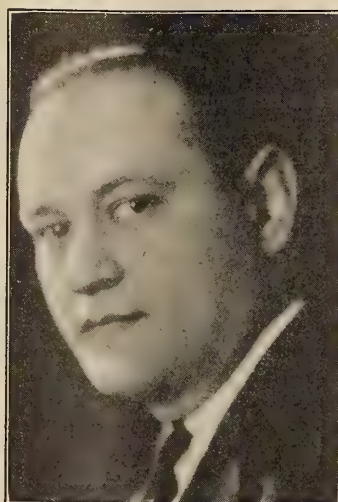
While every technical phase of the motion picture industry was given adequate attention, the outstanding feature of the meeting in Hollywood was the consideration given to projection. President Crabtree at different times during the convention expressed his appreciation for the co-operation given by projectionists and particularly emphasized the work done by the Projection Practice Committee headed by Harry Rubin. It will be interesting perhaps to your readers to know the personnel of this committee:

### Harry Rubin, Chairman

Thad Barrows	R. H. McCullough
S. Glauber	P. A. McGuire
J. H. Goldberg	F. H. Richardson
C. Greene	M. Ruben
H. Griffin	H. B. Santee
J. J. Hopkins	L. M. Townsend

It is very gratifying to express sincere thanks to President Crabtree for his interest in projection and the complete cooperation given by him to the practical projectionist. For the first time in the history of the Society one solid hour was set aside for the presentation and consideration of the Projection Practice Committee's report. The following excerpts from the speech of President Crabtree at the banquet on Wednesday night at the Roosevelt Hotel strongly indicate the value that the Society attaches to the importance of projection:—

"The subject of projection has been given special attention by the Projection Practice, Projection Theory, and Projection Screens committees



Harry Rubin, Chairman of the S. M. P. E. Projection Practice Committee

and, as a result of their efforts, recommendations for standard layouts of projection rooms of various sizes have been made and data secured for formulating a tentative standard for screen brightness.

## The Theatre of the Future

"If I were a producer, before participating in the threatened revival of musicals, I should pay a great deal of attention to the subject of projection. Most producers are likewise exhibitors and realize that it is foolish to spend millions on a production and have the artistry of the picture destroyed by imperfect projection. The projectionist is one of the most important cogs in the complex motion picture mechanism, and he should be encouraged and educated.

"The theatres of the future must have larger projection rooms to accommodate the increasing amount of

apparatus which will be necessary—manned by men who will watch over its operation with the skill and care of a conductor directing an orchestra. Such equipment may include machines for reproducing sound from a separate film record with multiple sound tracks to permit of sound perspective and special effects—with sound equipment having adequate reserve power to simulate every type of natural sounds—and with projectors capable of giving depth to the picture. Relief projection without the aid of auxiliary devices has recently been demonstrated, and these experiments have revived the hope for the ultimate production of stereoscopic motion pictures."

The conclusion of President Crabtree's speech will be of interest to every projectionist:

"In conclusion, may I remind my co-workers of a tribute paid to the engineer from this platform three years ago by the late Milton Sills on the occasion of the banquet tendered our Society by the Academy. These were his words: 'If I had my life to live over again, I should not elect to be an actor, but a scientific research worker. We actors get our names in electric lights, but we are soon forgotten and pass into oblivion. You scientists are making contributions of lasting value and are therefore giving one of the greatest services to the human race.'"

It is not my purpose to supply complete details regarding the convention because this will undoubtedly come to your readers in other forms. MOTION PICTURE PROJECTIONIST and the S. M. P. E. Journal will contain various articles from time to time regarding the convention and the various papers read will also be published together with the discussions.

## Convention Projection Committee

Members of the Convention Projection Committee were: H. Griffin, Chairman; K. F. Morgan, John Filbert, C. S. Ashcraft, and R. H. McCullough. It is particularly gratifying to me to have this opportunity to express my gratitude to these men and to the members of Local Union 150, of Los Angeles, who made it possible for me to receive the following official comment upon the work of the committee:

"The convention sessions were held in the very beautiful hall of the American Legion Auditorium. The latest type of sound projectors had been installed, and the whole program was characterized by excellent showmanship. Everything went off with perfect precision and there were no waits or delays to mar the occasion."

HERBERT GRIFFIN  
Chairman, Hollywood Convention  
Projection Committee.

## W. E. Installations

Recent reports from the W. E. Installation Dept. state that the total world-wide replacements of other sound equipments by the W. E. sound system now number 1,754. Of this number 1,387 replacements have been made in the United States and 367 in foreign territory. The demand for the W. E. Audiphones, equipment for the hard-of-hearing, remains steady, one section on the Pacific Coast having had 15 such sets installed within one week. The wide publicity accorded equipment for the hard-of-hearing in the technical and public press has created a strong demand for these sets among persons who are deficient in hearing.



# Requisites for an Efficient Loudspeaker

By W. L. WOOLF†

THE function of a loudspeaker is to convert electrical energy into the energy of sound. Electrical energy is supplied to the loudspeaker from the amplifier not in a steady flow but in minute impulses which occur at rates varying from thirty- to fifteen thousand per second. While the speaker is receiving comparatively slow impulses which occupy from one-hundredth to one-thousandth of a second, it is at the same time receiving the impulses of a shorter duration which occur at the rate of one thousand to ten thousand per second. The *quality* of a loudspeaker is judged by its ability to reproduce impulses of one frequency with the same efficiency with which it reproduces impulses of any other frequency.

In the movable coil type of speaker, an electric impulse from the amplifier passes through the movable coil of the speaker. The inter-action between the electric field caused by this impulse and the magnetic field in which the coil operates, causes a motion of the coil in the direction of its axis. This motion is transferred to the diaphragm or cone, depending upon the type of speaker in use. The motion of the cone, or diaphragm, as it is propelled by the coil, creates variation in air pressure which is interpreted by the ear as sound.

The task of the loudspeaker designer is to design the mechanical parts of the speaker so that the minute electrical impulses emitted by the amplifier are not lost, absorbed, or distorted, but that each tiny impulse is made manifest to the ear by a pressure wave equal in frequency and proportionate in intensity to the electrical impulse to which it corresponds.

## The Process of Translation

It is interesting to trace the progress of any impulse from the time it leaves the amplifier until it reaches the ear. Consider an electrical impulse leaving the amplifier and passing through the coil. From the moment it commences on its precarious career, this impulse is beset with enemies which tend to waste it and change it or to obliterate it entirely. The coil itself offers resistance to the passage of the current which reduces its magnitude. This is not so serious, because with powerful amplifiers currents can be built up sufficiently strong so that considerable loss of intensity can be suffered without damage. It is important, however, that this loss be uniform over the entire audio spectrum, otherwise certain notes will be reproduced proportionately louder than others.

If the coil possess inductance or capacity, or both, however, it will move with greater efficiency when propelled by impulses of certain frequencies than when impelled by impulses of other frequencies. For this reason, the capacity and the inductance of the coil should be kept as low as possible, otherwise notes of certain frequencies will be grossly exaggerated and may cause blasting of the speaker when those notes are struck.

The mass of the coil should also be kept as low as possible and yet afford sufficient current-carrying capacity.

The movable coil is wound on a core or form. It is imperative that every motion of the coil be converted into motion of the core, and that this motion be transmitted in turn to the diaphragm and finally to the ear through the medium of the air. Should there be any slip of the coil on the form or any accordion or breathing action of the form, the full magnitude of motion of the coil will not be transmitted to the diaphragm. It is also important that the diaphragm, or at least the major portion of it, be extremely rigid, otherwise that portion of the diaphragm directly connected to the coil may vibrate and, due to flexing, the major portion of the diaphragm may remain practically stationary.

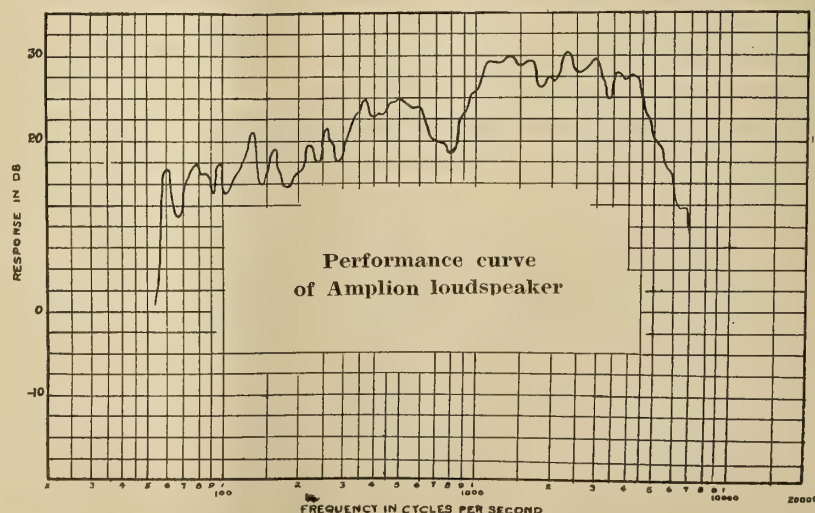
## Efficiency Losses

The losses that occur in a loudspeaker may be likened to a loss of energy in a railroad train. Supposing an engine attached to a long string of cars were to move forward and backward on the track through comparatively short distances. If one hundred cars were connected in the train and if, for illustrative purposes, the connecting links between the cars would permit a play of one foot between each car and its neigh-

bor, if all cars were backed closely together, the engine would travel forward one hundred feet before the rear car would feel its pull. If the engine went constantly forward and backward over a distance less than one hundred feet, there would be no motion in the rear car at all. Movements of one foot would all be absorbed in the connecting link of the first car. Movements of fifty feet would be absorbed in the first fifty cars. Only movements in excess of one hundred feet would survive and be translated into motion of the rear car.

Impulses of a frequency of four or five thousand per second or less are effective in most loudspeakers, but a frequency is reached in all loudspeakers at which, due to the small amplitude of vibration of the coil at that frequency, the entire amount of the motion of the coil is lost insofar as it is translated into sound waves which reach the ear. Losses occur due to a sliding or rolling of the coil wire on the core. The core elongates and shortens due to alternating tension and compression. The connecting point between the core and the diaphragm is alternately stretched and compressed. The most perfect piston diaphragm flexes to some degree. All these points of transfer of energy absorb a certain amount of the energy transmitted.

The mass of the form should be kept to the absolute minimum and yet allow sufficient strength to maintain the shape of the coil and to carry the thrust or strain to which the coil subjects it. This core transmits mechanical energy from the coil to the vibrating cone or diaphragm. In the air-column type speaker, the core is the connecting link between the coil



†Amplion Products Corp.



and a very light diaphragm approximately three inches in diameter and made of an aluminum alloy two-hundredths of an inch or less in thickness.

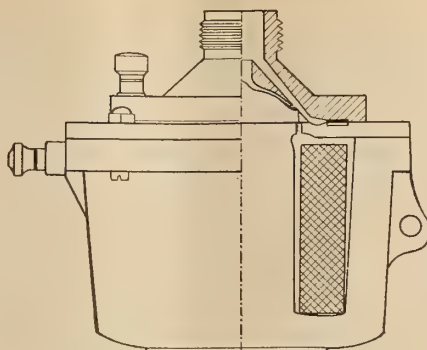
The light weight of the diaphragm subjects the core to much lower stresses than those occurring in a cone, since a cone has a mass many times greater than that of the diaphragm. The thrust, introduced and impressed upon the core by the coil, is conveyed to the diaphragm. As a result, the diaphragm is displaced, forcing air before it and building up a stress in the material of its periphery which resists the motion of the diaphragm. The incoming electrical impulse starts at zero value, builds up to a maximum and diminishes to zero again. As the diaphragm is displaced under the force of this impulse, the resistance to motion in the periphery increases until it equals the thrust of the core, at which point the diaphragm comes to rest. The decay of the electrical impulse leaves the stress in the periphery of the diaphragm unbalanced and this stress then starts the diaphragm on its way back to its original position.

The motion of the diaphragm outward creates a pressure in the air above atmospheric pressure, and the return motion of the diaphragm creates a suction which reduces the pressure in the air adjacent to the diaphragm below atmospheric pressure. The energy of electricity has thus been converted into the energy of sound. The lighter the diaphragm, core and coil, the greater will be the proportion of the electrical energy which is converted into sound, and the less will be the proportion of the electrical energy which is wasted in vibrating useless mass.

#### Area and Placement of Diaphragm

In order to cause the motion of the diaphragm outward to create the maximum obtainable pressure in the atmosphere, the diaphragm is confined in an air chamber, the only outlet of which is the neck of the horn or throat of the unit, which is small in area compared with the area of the diaphragm. The motion of the diaphragm at a given velocity compels an air velocity within the throat of six to eight times as great. Even after the diaphragm has created sound pressures, those of high frequency are particularly liable to dissipation if there is between the diaphragm and the throat of the horn an air pocket sufficiently large to absorb them. For this reason the diaphragm must be fitted as near as possible to the walls of the sound chamber and yet permit adequate amplitude of vibration of the diaphragm.

After a sound wave has escaped the pitfalls which lie between the amplifier and the throat of the horn, it may still be dissipated through eddy currents, which will occur in the horn if proper designing of the horn is not



The AA-102 dynamic unit

adhered to, through absorption by the horn walls unless they are very rigid, dense, and highly polished, or through failure to set the mass of air surrounding the listener into vibration, if the mouth of the horn is not sufficiently large.

For example, in the Amplion loudspeaker, a painstakingly careful attempt has been made to meet every problem of design. This speaker is found to perform with unusual uniformity over a wide frequency range and to be very high in efficiency. The accompanying blueprint shows the construction of the unit. A double layer coil of aluminum wire is wound on a very thin support or core of high rigidity. The core drives a very light but rigid piston diaphragm made by stamping a dome of very thin and light material. Air spaces above the diaphragm are reduced to a minimum. Sharp turns in air direction are avoided and an exponential horn is provided with a small opening on the unit end, a large bell or opening of 2,000 square inches, and with walls made of a material comparable in density to mahogany and capable of accepting a highly polished inner surface.

Although this massive unit weighs over fifteen pounds, the mass of the moving parts has been refined and reduced to less than twenty-five grains which is approximately 1/40th of an ounce, the weight of the average cone. In this extremely light weight of the moving part section lies the secret of the high efficiency of such units as the Amplion. To insure all movements of the coil being translated into the motion of the diaphragm great rigidity is maintained in the coil, core and diaphragm. To avoid losses of high frequencies actually reproduced by the diaphragm, the air space in the air chamber above the diaphragm has been reduced to a minimum. To provide loading of the diaphragm, the throat of the horn is reduced to one-half inch in diameter. To avoid absorption of energy in the walls of the horn, a material is provided of great stiffness and density. To avoid absorption of high frequencies in the horn, the interior surfaces are highly polished. To provide an adequate grip of the pressure waves produced

by the diaphragm on the atmosphere, the speaker is provided with a large opening. Eddy losses between the throat and bell are prevented by the proper rate of expansion.

The success attained by fine workmanship and careful observance of every point of design from the amplifier to the listener is attested by the accompanying performance curve, from which it will be noted that a proper knowledge of design and careful workmanship have been rewarded with high efficiency and uniformity of performance over a wide range of frequencies.

### High Court Denies Writ Appeal In Ries Patent Case

The last chapter of the Ries patent litigation, as far as the Western Electric reproducing system is concerned, has been written as a victory for the Western Electric Company by the U. S. Supreme Court in a decision denying General Talking Pictures' petition for a writ of certiorari. This petition asked for a review of the decision in favor of Western Electric of the Court of Appeals of the Third Circuit.

The litigation started with an infringement suit brought in June, 1929, by General Talking Pictures against the Stanley Company of America because of its use of the Western Electric Sound System. In accordance with its contractual obligations, the Western Electric Company assumed the defense. In the U. S. District Court at Wilmington, Del., Judge Morris held there was an infringement of the Ries patent. This decision was subsequently reversed by the Court of Appeals. A petition to the Court of Appeals by General Talking Pictures for a re-hearing was denied in April of this year. Final recourse was taken by General Talking Pictures to the U. S. Supreme Court in a petition for a writ of certiorari. It is the denial of this petition that marks the end of this litigation.

#### Other Suits Pending

With respect to three other patents on which infringement was claimed in the District court, Judge Morris held that there was no infringement. The claim on these three patents was abandoned after Judge Morris' ruling in respect to them was sustained by the Court of Appeals. Western Electric, having been sustained in its position that its reproducing equipment does not infringe General Talking Pictures' patents, will continue with its suit for infringement against General Talking Pictures, filed some time ago in the U. S. District Court for the Southern District of New York.



# As *The* EDITOR Sees IT

## † *The Lesson of the Grading System*

CANADIAN authorities have inaugurated a grading system for motion picture projectionists. This system embodies a written examination which must be taken by all projectionists who desire a license. The mark attained in the examination determines the classification—that is, whether A, B, or C. Theatres are also graded according to the same classification. Projection licenses are issued which prominently display the worker's classification, and the holder is permitted to work only in that type of house for which he has qualified in the examination.

This system should provide much food for thought on the part of projectionists everywhere. Apart from the fact that, in our opinion, the Canadian examination is a pretty stiff one (it consists of about 300 questions covering the theory and practice of all phases of projection work), and our disagreement with the basic idea of the gradings, we should like to direct the attention of all projectionists to the implications of such a plan. But first let us consider the reasons for the adoption of this plan and its method of operation. The system was obviously designed as a safety measure for the protection of theatre patrons, inasmuch as Canadian provinces cannot be supposed to have usurped the exhibitor's prerogative of passing on the *quality* of projection. Following this premise, we find that the A-grade men work in A-grade theatres, B-grade men in B-grade theatres, and likewise with the C-grade men. A B-grade man may work in an A-grade theatre, but he must be "covered" by an A-grade man.

According to the Canadian idea of things, a C-grade man is not as efficient a projectionist as is an A-grade man. If this be so (and we do not say that it is not), then why assign a less competent man to a C-grade theatre where the chances of fire and panic are infinitely greater than in an A-grade house, which benefits by modern methods of design and construction and usually has superior facilities for coping with emergencies? Following this line of reasoning, we might speculate on the real reason for the establishment of this grading system.

How many of us are there who will immediately sense the danger to projectionist Local Unions in this plan? Very few, we should say. A little serious thought, however, will soon lead one to the conclusion that somewhere, somehow, such a system affects the number of hours of work and the wages for same. For, to follow what must be the logical reasoning of the theatre man, why should a C-grade man receive the same pay and enjoy the same conditions as an A-grade man? The answer would be, he shouldn't. And what would be the Local Union's reaction to a proposed introduction of a similar plan in its locality? We think it would run something like this: If our men are graded, and their pay based on the mark attained

in such an examination, then our function is to get busy immediately and see that *all* our members pass with a high mark. Which brings us face to face with a pet proposal of this department: the insistence by the Local Union that all its members be proficient in every detail of their work. We have heard that Local Unions are not interested in establishing and furthering an educational medium for their members, but we do not believe it. And even if this were true, circumstances similar to those faced by our Canadian friends would leave the Local Unions with absolutely no choice in the matter.

What is the answer to all this fact and fancy? It seems to us to be very simple, to be but the reiteration of that which has been said herein on many occasions. Let every Local Union immediately establish a medium for the education of all its members in every phase of projection work—that is, those Local Unions which do not now enjoy such facilities. For those Local Unions which already have educational societies, or which sponsor educational activities in some form, let these units redouble their efforts in this direction. In the absence of any national organization to supervise such an educational program on a broad scale, the problem is directly up to the individual Local Union. Let there be no shirking of this very important task, lest the big wind blow and find the branches weak.

## † *Good Work—and a Tribute*

THE recent S. M. P. E. Convention in Hollywood was of vital importance to projection work. A detailed report of the activities in this direction appears elsewhere in this issue, and there is no need for further general comment along this line in this department. However, we feel that we should be sadly lacking in our duty if we let pass this opportunity to pay tribute to a splendid piece of work in the form of a report to the Convention by a projectionist—Harry Rubin, Chairman of the Projection Practice Committee of the S. M. P. E. On several occasions in the past we have been forced to quiet our conscience and criticize the Society for the vacuity of the work done by projection committees, and there was a time not long ago when we despaired of the Society ever recognizing projection as of vital importance in the motion picture scheme of things and tackling its problems in a two-fisted manner.

But there can be no such complaint this time. Rubin and his committee co-workers turned in a report to this last S. M. P. E. meeting which is a perfect gem, a report of tremendous importance to projection and one which reflects much hard work and a sane, practical and upstanding job by a group of men who realize the importance of projection. Projectionists and all those interested in projection work are indebted to Rubin and his associates on this committee for this piece of work.



## Coast A. P. S. Chapters Favor Secession

By JAMES J. FINN

**D**ISINTEGRATION of the American Projection Society and its passing as an important factor in the projection field and in the affairs of projectionists appears likely as a result of action taken recently by five A. P. S. chapters on the West Coast. Dissatisfaction with the control exercised and the manner in which the affairs of the Society are managed by the Supreme Chapter in New York is the reason set forth in a resolution approved by the members of the five Coast chapters which recommends the surrender of their charters to the Supreme Chapter and the immediate formation of a new projection society to be launched with a nucleus of as many A. P. S. chapters as follow the lead of the West Coast members.

The five West Coast chapters who were parties to and approved of the resolution recommending secession are No. 7, Los Angeles; 19 San Bernardino; 11, Vancouver; 16, San Francisco, and 12, Oakland. Aligned with these five chapters is the organized but as yet unnumbered chapter at San Diego.

"The Supreme Chapter of the American Projection Society has demonstrated its managerial inefficiency in various manners," is the preamble of the resolution adopted, which proceeds to enumerate what is termed only a "partial list" of objectionable practices. (1) Continued negligence in replying to correspondence of the various chapters, thereby embarrassing the elected officers of these chapters because of their lack of information concerning A. P. S. activities. (2) Negligence in promptness of issuing charters and certificates when properly requisitioned for same. (3) Lack of advertising in the cause of academic endeavors, which is one of the avowed cornerstones of the Society. (4) Lack of cooperation in the matter of securing technical data in printed form or lecturers for oral instruction.

"(5) Failure to provide a regular publication, thereby further belittling the officers of the branch chapters. (6) Failure of notification of branch chapters of Supreme Chapter election (7) Negligence in the matter of calling a convention in accordance with the provisions contained in Art. 5, Sec. 1 of the General Constitution and By-Laws, which read as follows:

"When ten (10) chapters are in existence a Convention shall be held each year, during the month of June, in any town or city decided upon during the January meeting, by a majority vote of the Supreme Board of Governors."

### Resolution For Secession

"(8) Negligence in notification of branch chapters of the financial status of the Society. The Committee feels that lack of such notification has caused the branch chapters to lose faith in the Supreme Chapter, its officers and organization.

"Therefore, be it further resolved:—That this committee, after due consideration of the foregoing facts, do unanimously agree that our respective chapters should surrender their charters to the American Projection Society, and organize a projection society for the purposes of promoting fraternal and academic endeavor and to embody such other features as may be suggested and written into the new constitution. Headquarters of the new organization to be located in Hollywood, California. Branch chapters to be organized wherever possible under favorable conditions. The new organization to be composed immediately of as many of the now existing A. P. S. chapters as possible. The committee does not wish to exclude any chapter or city that sincerely desires to affiliate. It does, however, particularly desire the co-operation of the chapters and cities of the Western part of the United States and Canada in this move. Signed: for Los Angeles: Sidney Burton, D. Koskoff, Fred Borch, F. McBride, R. McDonald, B. Babcock, W. G. Crowley, H. R. Cage, H. E. Alford, C. M. Fowler; for San Francisco: Frank L. Seavier and Frank W. Costello; for San Diego: J. J. Russo, J. W. Salyer, and S. H. Metcalf; for Vancouver: M. H. Thoreau and W. Mac Millan; for Oakland: Lloyd C. Litton; for San Bernardino: J. O. Ellery, Jr., and H. E. Reynolds; and for Cleveland, Victor Welman (by proxy-Sevier)."

Victor Welman, of Cleveland Chapter 18, speaking over the telephone to a representative of MOTION PICTURE PROJECTIONIST, said that the inclusion of his name as a signer of the resolution (by proxy-Sevier), was indicative of his approval of the list of grievances and his desire to encourage the launching of some movement for improvement but it did not indicate his attitude on secession from A. P. S. and the subsequent formation of a new organization.

"I am unalterably opposed to secession," said Welman. "Secession is usually the first thing thought of in such situations but time has proven that it should not be resorted to until all other possible remedies have been tried. There is no use trying to hide the fact that the A. P. S. as a whole is not functioning satisfactorily, and it is apparent that many members are disgruntled and ready to throw up the sponge. However, I am confident that a good job of reorganization will answer the needs of the situation. I favor the headquarters being on the Coast; and I do not think the present national officers will oppose a reorganization."

Dissatisfaction with the conduct of the Supreme Chapter in New York and dissension among the rank and file of A. P. S. members has long been

rampant, but no definite move to remedy the situation was taken until this recent move on the part of the West Coast chapters. The prevailing feeling among the members is that they have long been paying for something which they did not get and that the per capita tax was an imposition in the light of the inactivity of the national offices of the Society in the direction of the various chapters.

While a reorganization of the American Projection Society has been rumored from time to time within the past two years, no definite action by the chapters was forthcoming to force the hands of the directing officers. Many promises of renewed activity and a more businesslike conduct of the national offices have been received, according to several chapter heads, but these promises were never kept.

### Opinion Divided on Resolution

A sharp division of opinion among the various chapter leaders and members with respect to the proposed secession move of the five Western chapters is apparent. There are some who are not only opposed to the general outline of the West Coast plan but also to the manner of its doing. The West Coast chapters, it is felt, have overstepped themselves in meeting and passing a resolution for secession without first ascertaining the sentiment of the Supreme Chapter in New York and of the various other chapters not resident on the Pacific Coast.

A hurried canvas of seven A. P. S. chapters by MOTION PICTURE PROJECTIONIST discloses that reorganization of the A. P. S. at an early date is earnestly desired by all members, but that they are unalterably opposed to the idea of secession from the A. P. S. and the formation of a new organization.

The sentiment of a majority of the chapters shapes up as follows: (1) The American Projection Society is the oldest organization of its kind in existence, and as such it has gained much prestige within the industry and has compiled a record of valuable service to projectionists in former years. Therefore, the identity of the Society should be preserved. (2) Reorganization is preferable to secession for the reason that the latter might not have the wholehearted support of all factions and, if only partially successful, would split the organization wide open and make formation of a truly national society impossible. (3) Recent developments within the industry, plus the demonstrated enterprise and efficiency of the West Coast chapters, justify the transfer of the national office of the reorganized society to Hollywood. (4) Members should receive that for which they pay dues and a per capita tax. (5) The reorganized society should be



truly national and all sections of the country should be represented in its directing body.

#### Criticize Coast Chapters

Rumblings of dissatisfaction with the procedure of the West Coast chapters in meeting and adopting the secession resolution are heard from several quarters. One prominent A. P. S. man opined that he had no objection to the transfer of the general offices of the Society to the Coast but that he was a bit suspicious of the very evident desire for power manifested by the Coast chapters. He characterized the West Coast developments as a bit high-handed and lacking entirely the broad national outlook necessary to a successful administration of a national projection society.

The latter part of the resolution has also evoked no little criticism because of the inclusion of the statement "The committee does not wish to exclude any chapter or city that sincerely desires to affiliate. It does,

however, particularly desire the cooperation of the chapters of the Western part of the United States and Canada." This statement is interpreted in Eastern chapters as evidencing favoritism at the very outset for far Western chapters.

Defense of the action of the Coast chapters was expressed by another A. P. S. leader who said that some such action was necessary if ever an improvement in Society affairs was to be effected. While secession should not be advocated until other remedies had been tried, he said, the mere threat of secession might "start the ball rolling and provide a wedge which would open up things and eventually result in reorganization."

Efforts to secure a statement from International President George Edwards proved unavailing. It is understood, however, that the Supreme Chapter is amenable to reorganization, but not to secession, and will not offer serious opposition to the removal of the offices to the Coast.

## New RCA Special Size Sound Equipment

(For theatres not exceeding 500 seats)

THE RCA Special Size Equipment is designed for use in theatres and auditoriums with seating capacity not exceeding 500 seats and cubic content not exceeding 75,000 cubic feet. It is designed for reproduction from film only and consists essentially of the following parts:

- 2 Soundhead Attachments
- 2 Projector Drive Motor Equipments
- 1 Amplifier
- 1 37 in. Directional Baffle
- 1 Stage Speaker Unit
- 1 Set of Tubes and Lamps
- 1 Spare Parts Kit

This equipment is designed essentially for operation from 110-volt, single-phase, 50-60 cycle AC power supply, but can be adapted for operation from either 110-volt, single-phase, 25-cycle AC or 115-volt DC by the addition of suitable conversion equipment for which an additional price is charged.

It is adaptable for use with Simplex, Kaplan, Fulco, Superior, or Power's Projectors. In the case of Fulco or Superior Projectors, it is necessary that the exhibitor obtain prices for adaptable parts from the manufacturers of those projectors. In the case of Power's Projectors, a slight additional charge is made.

#### Soundhead Attachment

The soundhead attachment consists of two castings; the main case and the mounting bracket. The main case consists of three parts: the exciter lamp housing, the film compartment and the photocell housing. In the exciter lamp housing is mounted the 10-volt, 7½-ampere exciter lamp, socket, and shield. This exciter lamp is operated directly off the AC power. A transformer reducing the 110-volt supply to 10 volts, together with an

"on-off" switch is mounted at the rear of the exciter lamp housing. In addition, a 110-120 volt tap switch is provided to compensate for the varying line voltage. This is the first time that a completely AC operated exciter lamp has been used in RCA theatre equipment.

The film compartment contains optical system, curved gate, and constant speed and holdback sprocket. The optical system is of new design and is considerably improved over the former types. It is hermetically sealed in the factory, thus preventing oil from getting in and obscuring the passage of light through it. The horizontal slit through which the light passes is adjusted and also sealed in the factory insuring more perfect reproduction and facilitating service requirements.

The photocell housing contains the photocell transformer, photo-electric cell socket assembly and the UX-868 photocell together with terminal strip.

#### New Drive Method

This soundhead differs from former soundhead attachments in connection with the method of drive. This soundhead is designed to be driven through a maximum size fly wheel mounted on the constant speed sprocket shaft. This fly wheel is grooved for three belts. The motor is mounted on a bracket on the pedestal of the projector and drives this fly wheel through the use of a triple pulley and three belts.

Where Simplex projectors are used, standard Simplex motor brackets are supplied. Where Power's projectors are used, a special motor bracket is provided.

This amplifier is completely AC-operated. It is designed for wall mounting. For this application a special metal bottom plate is provided. Suitable mounting brackets are to be furnished by the theatre. On the front of the amplifier is located a "sound monitoring jack," and "on-off" switch, volume control and "sound change-over switch." All controls are so located on the amplifier that the latter may be mounted on the front wall of the projector booth between the two projectors.

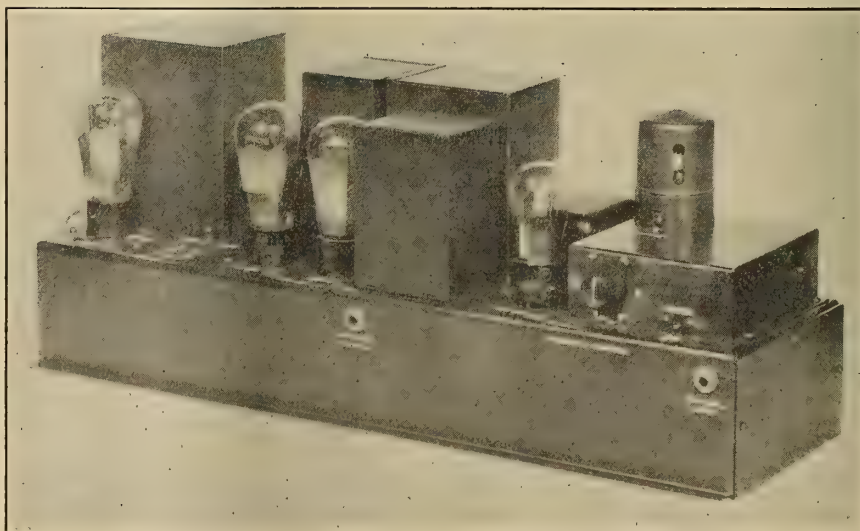
Two stages of voltage amplification followed by a single stage of power amplification are used in this amplifier. The tubes required are as follows:

- |          |          |
|----------|----------|
| 1 UY 224 | 1 UX 245 |
| 2 UY 227 | 1 UX 280 |

#### Not a "Push-Pull" Amplifier

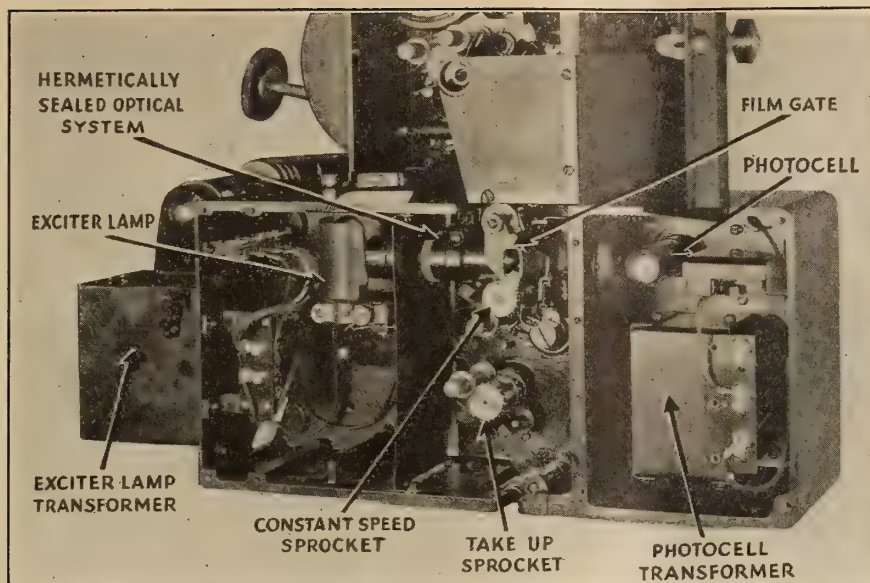
This is the first satisfactory amplifier to be used with sound reproducing equipment which does not require "push-pull" power amplification. The undistorted power obtained from this unit is sufficient to give satisfactory reproduction in all auditoriums with cubic content up to 75,000 cubic feet. The overall dimensions of the amplifier are:

Length 23¼" Height 10½" Width



Front view of amplifier for RCA special size equipment





Detail of soundhead for RCA special size equipment

7 $\frac{3}{4}$ " and the total weight is approximately 43 pounds.

The standard 37" directional baffle and stage speaker unit heretofore supplied on all types of equipment is to be supplied with the Special Size Equipment. Only one baffle and speaker is required with this equipment. The amplifier has been designed to give such reproduction that in small theatres, satisfactory sound can be obtained from any point where a satisfactory picture can be seen. For this reason, it is not necessary to use more than a single baffle and speaker.

A complete set of tubes and lamps are supplied. In addition a spare parts kit is supplied as part of standard equipment. This set consists es-

entially of a cabinet with spare tubes and lamps, speaker cone, and soundhead parts.

Where it is desirable to operate this equipment from 110-volt, single-phase, 25-cycle power supply, 25-cycle projector motors are supplied instead of standard 60-cycle projector motors and in addition a  $\frac{1}{2}$ KVA 25-cycle-to-50-cycle frequency converter is supplied to furnish power for the amplifier and exciter lamps. Where it is desirable to operate this equipment on 115-volt DC power supply, standard DC speed regulated projector motors are supplied and in addition a  $\frac{1}{2}$ KVA DC to AC rotary converter is supplied to furnish power to the amplifier and exciter lamps.

exciting lamp holder fit on the supporting prongs snugly? If it is loose, spread the upper prong by inserting a small screw driver in the slot, and tighten the lower prong by squeezing the split halves together with a pair of pliers.

We have not covered innumerable things that should be checked daily, but this article is intended to cover only those things that require less frequent attention, but are nevertheless very important and should be checked at regular intervals to properly safeguard against a shut down.

Nor are the motor generators and projectors exempt from this rule. Motor generators should be tested for possible grounds. If a permanent test lamp is connected, it will require but a moment to do this, as well as to test the projector lamps for ground. Motor generators should also have all dust blown from around their armatures, etc., once each week, using a hand bellows to do it. The level of the oil in the bearing oil wells should be tested and the commutators carefully examined for possible scratching or cutting and for proper depth of commutator insulation under-cutting.

#### Projectors and Drive Gear

The projectors should be gone over carefully. Using a magnifying glass, examine all sprocket teeth for under-cutting, or wear. Promptly reject any intermittent sprocket which shows any under-cutting at all, or any appreciable wearing.

Examine all drive chains for slackness. See that the driving motor journals are properly and adequately lubricated. Test the rotating shutter for lost motion in the gear train. Examine the screen closely for travel ghost and take whatever steps may be necessary to promptly eliminate it, if any shows.

Don't depend upon the view of the screen from the projection room. The projectionist should either go down front and examine it himself, or have someone else do it. Judge only by white-letter black-background titles. If pads are used to collect oil seepage inside the projector mechanism, examine them on that day and make renewal if it is advisable. Test the intermittent sprocket for circumferential motion when it is on the lock.

#### Short Reels Increase Costs

Some studios have been releasing reels as short as 400 ft. and frequently less than 600 ft. Short reels increase costs and difficulties throughout the release, particularly in shipping and in exchange inspection work. Short reels also make unnecessary additional work in theatre projection by requiring more frequent changeovers. This encourages the already extensive practice of doubling-up reels, with resulting mutilation of the print.

## Careful Periodic Equipment Inspection Necessary

EVERY sound projectionist should set a time during which every part of the equipment will be gone over very carefully and inspected for possible fault or weakness. In theatres newly installed with equipment this inspection should be made with the service engineer, who will devote all the time necessary in order to acquaint the projectionist with the intricate details of the mechanism.

First we will go back to the source of power supply, the storage batteries. They must be kept in proper condition at all times. Check the level of the water over the plates. Keep all the terminals tight and free from corrosion. Clean the tops of the batteries with a cloth moistened with ammonia and water. Of course, take a hydrometer reading of all batteries at this time.

#### Checking the Amplifier

On checking the amplifier, examine the connection on the back of panels. Be sure they are all tight and be sure to place covers home when removed.

Otherwise there will be no show. Remove all the tubes from their sockets and clean the contact prongs with an ordinary pencil eraser. Check the spring contacts to be sure they have sufficient spring to make a good contact.

In the 49-A amplifier on the projector the projectionist should also clean the tube and socket contacts. Examine the position of the photoelectric cell to be sure that the window is in the proper position to obtain all the light possible from the film. Check the position of the guide rollers on each projector to determine whether the sound track is in the proper position when it passes the slit. This should be done with the negative film provided in the kit of spare parts.

#### Sound Unit Inspection

Next go back to the exciting lamp. When was it last changed? Is it properly focussed and free from discoloration? Check all the connections in the 1-A sound unit. Be sure that they are all tight. Does the



# A 35mm. Portable Sound-Film Projector

By HERBERT GRIFFIN†

*Reflecting the trend toward compactness in design and simplicity in operation of both projection and sound reproducing equipments is this portable picture-and-sound reproducing apparatus described in the accompanying article. While designed primarily as a portable unit, this equipment has a complete professional optical system and there is nothing to prevent its use in moderately-sized auditoriums and, for that matter, in small theatres where a picture of the maximum size of 12 x 16 feet is desired. For this purpose it would be used with the 900-watt, T-20, 30-volt, 30-ampere theatre projection incandescent lamp designed for use with a transformer. Any amplifier may be connected to this equipment, and it is a matter of personal knowledge by the writer that the resultant reproduction can be the equal of that in a first-class theatre, or even better. This development is significant in pointing the way for future progress in the art.—JAMES J. FINN.*

**T**HIS new equipment consists of a portable motion picture projector and sound reproducing equipment of fundamentally new design, which in motion picture projection and sound reproduction will produce results even superior to those obtained with the best theatre equipment. It is the first apparatus of its kind which has been designed to fulfill these two requirements and in no sense is it to be confused with that type of equipment consisting of makeshift apparatus assembled from silent equipment with sound attachments added.

Excellent projection and first-class sound reproduction, of course, must be the major considerations nowadays when designing new equipment, and with this in mind the optical system for motion picture projection has been selected with a view to producing results heretofore unobtainable in this class of equipment. The illuminant may be either the T-20 900-watt, 30-ampere monoplane filament lamp, which has been generally used with excellent results in the medium size

and smaller motion picture theatres of the country, or the T-20 1,000-watt 110-volt lamp. A pre-focus mogul base lamp socket is provided so that either of these lamps may be used interchangeably and, inasmuch as a separate circuit is provided to this pre-focus socket, no internal wiring changes are necessary regardless of the type of lamp selected. It is only necessary to plug a 110-volt A.C. line into the lamp receptacle, the position of which will be pointed out later, or when using the 900-watt lamp, a transformer designed for use in connection with it may be readily connected in the circuit.

The condensing system is the well known and extremely efficient Bausch and Lomb Cinephor PM-15 and PM-25, and the projection lens mounts are so constructed that any type of lens may be used having standardized dimensions. This means that the full-size, No. 2 or Series II lenses may be readily accommodated in any focal length.

## The Sound Reproducer

The sound reproducing equipment has received equal consideration: the exciter lamp socket is rugged and the optical system is sturdy and rigidly mounted. The sound reproducing gate deserves special attention inasmuch as no tension shoes or springs are used at the sound take-off aperture. The film after leaving the sound gate feed sprocket is passed over a roller and tension is applied at this point. A curved plate is provided, the curvature following the tangent of the roller above referred to, and the film after passing the sound aperture plate follows the tangent of the plate over the rim of the sound sprocket. It is apparent, therefore, that the film remains in absolute contact with the sound aperture plate and that not only is buckling eliminated at this point but also, because there are no tension shoes or springs in contact with the film, there is no danger of emulsion collecting and causing the many defects in sound reproduction traceable to this source. The film is laterally guided by the edge on which the sound track appears, so that there is no weaving of the film in passing the reproducing light beam.

The photocell is mounted directly behind the sound aperture plate, and because there are no lenses of any kind between the plate and the photocell, the maximum amount of light is passed through to the cell. A shield completely envelopes the cell except for a small window to allow the passage of light from the optical system; and should it become necessary to quickly replace the photocell, this shield may be immediately removed and the cell instantly replaced.

Referring to Fig. 1, the pre-focus socket providing interchangeability of lamps is seen at A, the Cinephor condensing lens system at B, the rear shutter housing on the operating side at C, and the operating motor with its cooling fan at D; the mechanical filter between the motor and driving mechanism may be seen at E; an auxiliary shield is seen at F, the purpose of this shield being to protect the projectionist's eyes from the bright glare of the projection lamp should it at any time be necessary to open the rear door while the projector is in operation. At G will be seen three switches, one for the exciter lamp, one for the projection lamp, and the third one for the operating motor. These are readily accessible through the rear door.

## Film Operating Parts

A complete idea of the arrangement of the film operating parts may be obtained by referring to Fig. 2, which also shows the film in place for operation. At A is the feed sprocket; at B the intermittent sprocket; at C the sound gate feed sprocket; at D the constant speed sound sprocket; at F the take-up or holdback sprocket; at G, H, and J, are the pad rollers which maintain the film on the two feed sprockets and the holdback sprocket; at K and L are the tension shoes for the sound tension roller and the constant speed sprocket, respectively; and at M the tension shoe to maintain the film on the intermittent sprocket. All of these pad rollers and tension shoes are so designed that they are locked in either the open or closed position, and the possibility of their changing positions with relation to the sprockets when closed is entirely

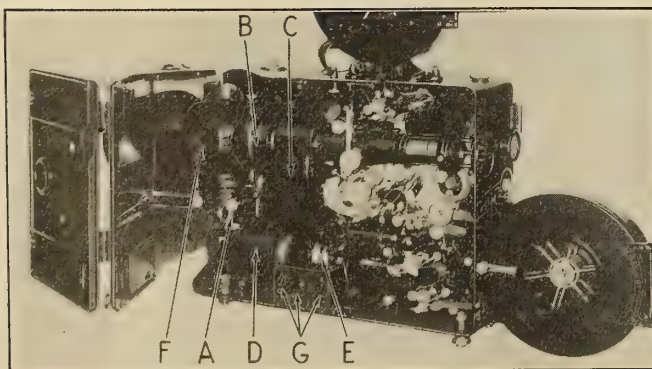


Figure 1

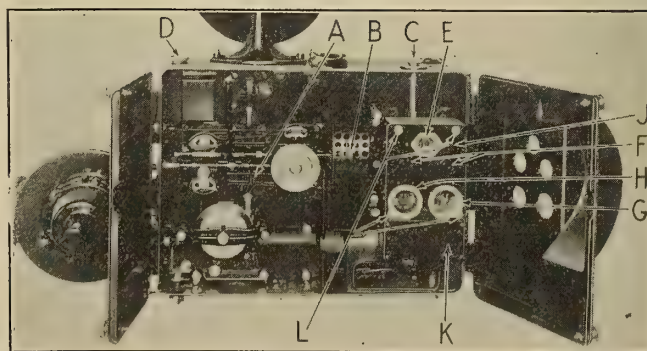


Figure 3

†International Projector Corp.



eliminated by the positive stops provided, which, once adjusted, always remain fixed in the same position thereafter. At N is the motion picture projection gate which may be opened or closed by turning knob O to the right or left, respectively, and in either position the gate is securely locked.

A double aperture of the vertical sliding type is provided and by turning knob P either the silent film projection aperture or the sound film projection aperture is brought into place and locked in position. At Q is a pilot light to give illumination for properly placing the picture in frame when threading. Stripper plates are provided for all sprockets, three of which may be seen at R, Fig. 2. At S is seen the framing handle controlling the rotation of the intermittent sprocket for framing the projected picture either before or during operation; at T, U, V, and W, are seen the exciter lamp socket, optical system, sound aperture plate, and photocell shield, respectively, and the path of the film through the mechanism may be readily observed by careful study of this picture. The entire projector is built up of separate assemblies any one of which may be readily removed at will without unduly disturbing any of the other parts.

The operating mechanism is entirely enclosed on side also by means of two doors. Opening these doors exposes to view the mechanical operating parts of the equipment, as in Fig. 3. By referring to this figure it will be noted that the equipment is direct connected throughout to the motor; no belts of any kind are used, and a mechanical filter is placed between the motor and the mechanism so that vibrations or other impulses from the motor cannot be transmitted to the mechanism proper. The driving shaft then continues straight through the lower part of the projector and is gear connected to the constant speed sprocket shaft, the vertical driving shaft driving the balance of the pro-

jector, and the take-up magazine. The constant speed sprocket is satisfactorily filtered by the same type of filter employed in the motor shaft and there is but one pair of gears between the driving shaft and the constant speed sprocket shaft.

The intermittent movement and shutter synchronizing means are mounted in one common casting A, Fig. 3, and this system is fundamentally new in design. It also allows for but one pair of gears between the shutter shaft and the intermittent movement. The picture is framed by rotating the intermittent sprocket and this is accomplished by turning the framing handle shown at S, Fig. 2, when the entire intermittent and shutter support casting A, Fig. 3, is rocked in the arc of a circle, maintaining absolute synchronism between shutter and intermittent movement, and allowing the elimination of the entire train of gears ordinarily present to accomplish this result in all other types of motion picture projectors.

Oiling of the mechanism is accomplished through oil tubes running directly to every bearing from common manifolds, and the type of bearing used together with the excellently designed lubricating system are an absolute assurance against the binding of the mechanism at any time.

#### Rear Shutter Equipment

The revolving cut-off shutter is placed between the condensing system and the aperture as in modern professional equipment and is entirely enclosed, as shown at B, Fig. 3. It is well known that the placing of the shutter in this position immediately reduces the heat incident upon the film by fifty per cent., and inasmuch as the light beam is always of the same dimension in this position it is unnecessary to use shutter blades of varying widths. This shutter performs a double function: no fire shutter in the generally accepted term forms part of this equipment, but the

revolving shutter, when the projector is idle, is entirely closed for its 360 degrees. When the projector reaches a predetermined speed, two blades of the revolving shutter fly open behind two fixed blades, the shutter then becoming in effect the usual cut-off shutter with two 90 degree blades. Attached to the shutter shaft also is a fan for forcing a cool draft of air over the entire rear section of the equipment containing the lamphouse. At C, Fig. 3, is shown a dowser knob by means of which, if desired at any time, the light may be cut off from the screen while the projector is running; and at D is shown the knob for sharply focusing the projection lens.

In the rear (Fig. 3), we see the input and output receptacles for carrying the current to and from the equipment during operation. At E is the 110-volt input from the line:—this feeds the motor through the motor switch and is wired in parallel with the two plugs F. One of these plugs is used to feed the amplifier 110-volt A.V., and the other for an extension lamp or any other device requiring 110-volt A.C. At G is shown the exciter lamp feed receptacle, and at H the receptacle previously mentioned, into which is plugged the A.C. line for feeding the projection lamp. All of these receptacles and the wiring connecting them are mounted in a complete assembly J, and all connections from the lamps and motor are made on a common panel board beneath the bakelite cover K.

Any current-carrying part may be readily removed by disconnecting the wiring at its particular terminal on the panel board, and the entire panel may be removed by disconnecting all of the wires from the various current carrying parts which are connected thereto, and removing the four nuts L.

The projector may be readily tilted to any desired angle by adjusting the tilting nuts. The upper and lower magazines may be easily removed by loosening the screws. The entire equipment, with magazines removed, may be packed in a trunk properly built to receive it, and the entire assembly weighs approximately eighty pounds.

None but the finest materials and highest grade workmanship are employed in the construction of this equipment and the International Projector Corporation feels that it can point with pardonable pride to this achievement.

#### RCA Suspends Theatre Service Charge For Summer Closings

Letters advising exhibitors that service charges will be suspended when their theatres are closed for a period of thirty days or longer have been sent to all theatres equipped with RCA Photophone sound reproducing equipment over the signature of J. H. Tingle, Treasurer.

"We are endeavoring to lighten the financial burdens of exhibitors who find it necessary to close their theatres," said Mr. Tingle in explaining the move. "Many theatres close dur-

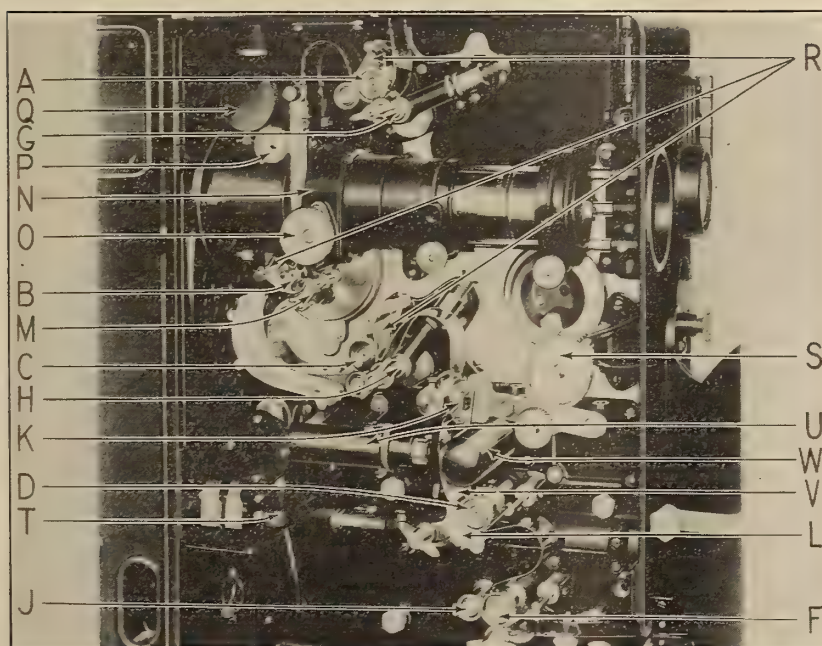


Figure 2



ing the summer months and we have modified our previous policy by suspending service charges during the period when they are dark. Upon receipt of two weeks' written notice of intention to close, we shall send engineers to the theatre to service the equipment for the closed period and upon like notice prior to re-opening will place the equipment in proper operating condition. This will lighten

the burdens under which many exhibitors are struggling at this time and take this method of bringing them as much relief as is possible."

Announcement of the standardization of service charges also has been mailed to exhibitors by Mr. Tingle. In establishing flat rates for service upon the various types of theatre equipment, a considerable reduction has been made.

## Two New Acoustic Aids Developed by W. E.

*A chronograph reverberation meter and a sound meter for the measurement of loudness of sounds are the latest developments of Bell Telephone Laboratories for the exclusive use of the Acoustic Consulting Service of Electrical Research Products. The operation and uses of these equipments, which are expected to prove of much value in improving auditorium acoustics, are described in detail in the appended article.*

AN electrical method of measuring reverberation time has been devised and incorporated into a reverberation meter. In the past reverberation time measurements have generally been made by a method originally used by W. C. Sabine, in which an observer measured with a stopwatch the length of time required for a sound of known intensity to decay to threshold as measured by the ear. This method gives surprisingly consistent results where the decay is slow and in the absence of noise. Where the decay is rapid, however, or in noisy locations, this method is rather difficult of application. Also it is a recognized fact that uncertainties may be introduced because of the variation in threshold between observers and with time in the same observer.

The electrical method is similar in principle to the Sabine method, the primary difference being in the substitution of an electro-acoustical ear, of controllable threshold sensibility, for the human ear.

Referring to Fig. 1, the electro-acoustical ear or microphone *T* converts sound energy into electrical energy which is amplified and rectified to operate the relay *R*. This relay is so constructed that when the rectified current exceeds a certain value the contacts *A* open and condenser *C* is charged by battery *B*. When the sound energy, which has been converted into electrical energy, drops into the lower limit of sensibility of the relay, the contacts *A* close, discharging the condenser through the spark coil *M* and causing a spark to jump from the point *P* to the drum *D*.

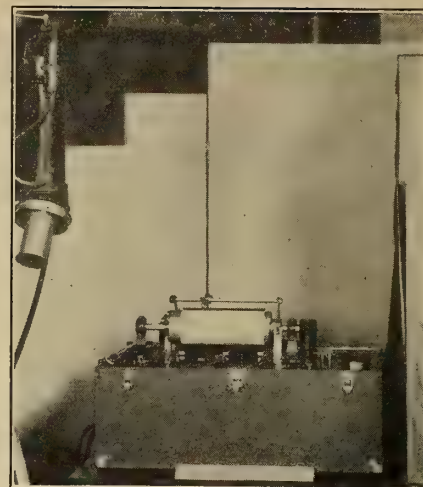
The drum *D* is rotated at a known constant speed. The discharge point *P* may be set at any place on the scale *S*. If the amplification of the amplifier is then varied in definitely known amounts and the point *P* is moved along the scale *S* accordingly, a series of points representing the decay of sound energy will be recorded if waxed paper is placed upon the drum.

This method, therefore, gives graphically an exact history of the decay of sound from which the reverberation time may easily be obtained if the speed of the drum is known.

### Measurement of Reverberation

In the measurement of reverberation time the source of sound may be anything which provides a constant energy level, the sources most commonly used being an oscillator or a frequency record with an associated reproducer and amplifier. The source is carried through a key *K*, associated with the meter, so that the tone may be interrupted.

The employment of this instrument yielding the exact history of the decay of sound has permitted fundamental research in the behavior of sound decay in complex auditoria. It has contributed to the development of a new fundamental formula of decay which is now commonly used and is known as Eyring's formula. Due to the fact that the decay of sound is shown graphically with this instrument, a double reverberation time has been found in some cases. This double time may have been suspected, but previous to the development of this instrument it has never definitely been measured, due to the fact that other methods of measurement give only the total time for a sound to decay a given amount. The cause of this double slope has been discovered and eliminated through the use of this instrument. It has also proven



The reverberation meter

of great value in determining the effect on reverberation time of coupling rooms, either acoustically or electrically.

In addition to its uses in purely research fields, this reverberation meter has a wide commercial application. It has been successfully used in the measurement of reverberation time of theatres, review rooms, sound recording stages, sound picture stages, broadcast studios, and other auditoria. Its use has given the reverberation time-frequency characteristic of the auditoria measured, thereby permitting more accurate correction of their acoustic condition. This is more than is ordinarily done in the mere computation of an auditorium in which consideration is generally given to acoustic conditions at only a single frequency. The meter has also been used in the measurement of the acoustic absorption of sound absorbing materials by the reverberation chamber method giving more consistent and more accurate results than any other known method.

### Operation and Uses of the Sound Meter

The second acoustic aid developed by the Laboratories for ERPI is the sound meter. The measurement of loudness of sounds has in the past been generally confined to audiometric methods. As the name implies, these have involved the judgment of an observer, and some standard source

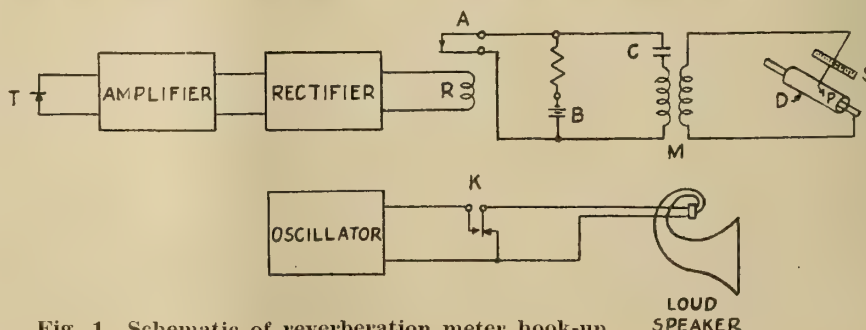


Fig. 1. Schematic of reverberation meter hook-up



of noise. Such measurements, while useful, are not essentially accurate, depending upon the skill of the observer and changes in the physiological and psychological condition of the individual. Moreover, the readings so obtained are only relative, and if sounds are of different character, the readings are apt to be misleading. Measurements by instrumental means have been, in general, of no comparative value and were generally expressed in some arbitrary units selected for the particular measurements at hand. Values, so obtained bore, in general, no relationship to the physiological effect, i.e., loudness, annoyance, or any other reaction of a human observer. Moreover, the inability to establish a common point of comparison made it impracticable to make relative judgments between any two sets of readings.

The sound meter herein briefly described is based upon the fact that the effects of noise are primarily interpreted through the human ear. The instrument is, therefore, designed to record the effects of noise in terms comparable to the loudness sensation as judged by the ear. It consists essentially of a microphone, amplifier, weighting network, indicating meter, and necessary battery supply, contained in two cases, both together being portable by one man.

The microphone picks up sound, converting it into an electrical current which is a counterpart of the original sound. This is then amplified by a vacuum tube amplifier and actuates a meter reading the loudness of sound directly in decibels. The decibel scale is an arbitrary one in which each unit represents approximately the smallest change in loudness that can be detected by the normal ear. Zero of this scale is near the threshold of hearing or the point at which sound becomes inaudible in a very quiet place. Since the apparent loudness of a sound of specified

energy is not the same for all frequencies, the amplifier is adjusted by means of a weighting network to simulate the sensitivity of the ear. At frequencies near 2000 cycles per second, the amplifier is most sensitive and decreases in sensitivity with increase or decrease in frequency from this value.

The dynamic characteristics of the meter are also adjusted to simulate the ballistic qualities of the ear. Thus the meter indicates visually to an accuracy of about one decibel, the extent to which the ear is affected by a sound. The range of the meter, in the interests of portability, is slightly less than the range of the ear. However, it is not anticipated that it will be required to measure to absolute threshold, nor sounds of actual painful intensity; and for practical problems the range is, therefore, adequate.

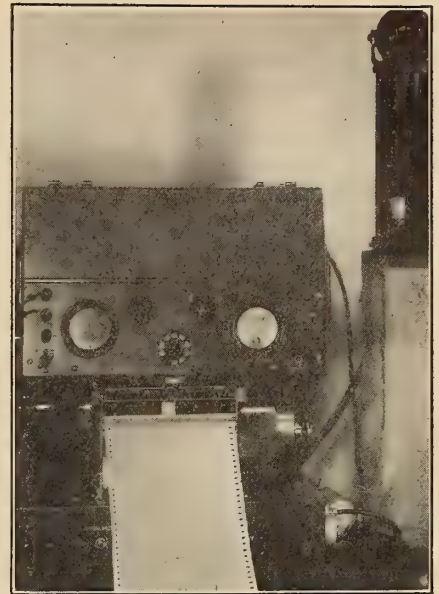
#### Graphic Record of Sound

Where a continuous graphic record is desired, a level recorder may be substituted for the visual indicating meter. The recorder can be adjusted to produce a graphic record of sound covering any period of time. The substitution of this device for the visual indicator alters the dynamic characteristics of the meter, since mechanical limitations preclude any possibility of a recording device fluctuating as rapidly as noise. However, if peak noise levels are not required, the level recorder is extremely satisfactory.

The meter alone merely indicates loudness and gives no information relative to the character or frequency distribution, which is equally important in any noise study. The frequency distribution may, however, be determined by the meter in conjunction with an analyzer attachment. Either broad band analysis to determine general characteristics of noise, or single frequency analysis for an exact determination of individual components may be made.

The meter because of its accuracy and ruggedness has allowed loudness studies of sound, which hitherto could not be accomplished with existing equipment. With the meter, observations may be taken under the most severe conditions, since the meter and observer may be at any convenient location, and the microphone placed at the point desired.

Obviously, the uses to which the meter can be put are manifold; surveys of noise conditions, determination of acceptable levels in various types of buildings, compliance of equipment with specified levels, are typical of one field of employment. Studies of loudness of other sounds, such as music, with relation to the performer or with relation to the architecture of the auditorium, represent another type of application. The

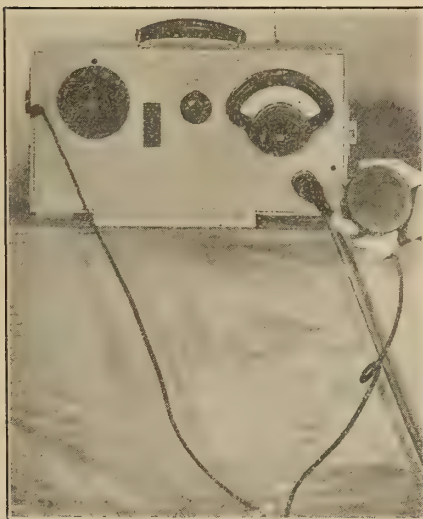


Noise level recorder

control of uniformity of manufactured products by means of acoustic measurements is itself a wide and distinctly useful field.

#### Limitations of the Equipment

Certain limitations in the use of the noise meter must be observed since it cannot discriminate between different sounds but indicates the total loudness of all sounds picked up by the microphone. Consequently, if it is desired to measure a sound not appreciably louder than others striking the microphone, it is generally necessary to stop all sources other than the one creating the sound to be measured. In some instances, it is possible to measure sound not appreciably higher or even less than the surrounding or background noise by use of the analyzer, providing the sound differs considerably in frequency composition from the background noise. The analyzer is adjusted to pass the frequencies of which the sound is chiefly composed and reject all other frequencies. Consequently, sounds of relatively high level, providing they do not fall within the band passed by the analyzer, will not affect the meter reading. Other limitations include the acoustic conditions surrounding the measurements, which must be fully accounted for to avoid errors.



The sound meter

#### Recent Progress in Projection Illumination Cited by Hall

The rapid advance of projection to a place of front-rank importance in the motion picture industry was emphasized by Theodore O. Hall, of Hall & Connolly, Inc., in a recent address to a group of New York City projectionists. Wide film and the possible effect of television on the motion pic-



ture exhibition business were discussed by Mr. Hall, who also supplied some interesting data on correct projection illumination.

"Business conditions will not be bettered by conversation," said Mr. Hall. "The industry need have no fear concerning the introduction of wide film, for this problem certainly is not as difficult of solution as was sound pictures, and the industry proved its ability to adjust itself to the latter. As for television, if the exhibitor finds he can utilize this new art, he will use it; and the equipment manufacturer who has his ear to the ground and is alert to his responsibilities will reap the profit.

"Just now we at Hall & Connolly are working every minute on the job of putting more and better light on the theatre screen. It really is surprising how projection—that is, just our little corner of it—has progressed in the past several years.

#### Under-Illumination Harmful

"It wasn't more than two years ago that illumination of from 15 to 18 foot candlepower intensity was considered great. Today some theatres

are averaging 30 foot candles or more. Exhibitors and the paying patron are fast becoming aware that a large number of eyestrain cases are due to under-illumination. We hear a great deal about the stereoscopic effect. Did it ever occur to you how both the depth and detail of a picture are improved and the stereoscopic effect more nearly approached as the illumination is materially increased?

"This is why we have in the past year increased the efficiency of our high intensity projection lamps approximately 100 per cent. Studio lighting, raw stock, laboratory methods, production technique, projectors, and screens are all far better than they were two years ago, and these improvements make it imperative for the lamp manufacturer to keep pace with progress within the industry.

"The accompanying table of figures might be said to constitute a short history of the progress of illumination. These figures show the comparative values of illumination of various types of D. C. arc projection lamps as determined in our laboratory."

TYPE LAMP	D. C. AMPS	TYPE COLLECTOR LENS	LUMENS
Straight Arc .....	70	4½" x 6½" & 4½" x 7½" Condensers	1,500
Low Reflector .....	30	7½" diam. B. & L. Elipt. Reflector	2,568
H.C.-3 11 mm. ....	80	4½" x 6½" & 5" x 9" Condensers	3,900
High Reflector .....	70	12" diam. B. & L. Elipt. Reflector	4,800
H.C.-3 13.6 mm. ....	120	4½" x 6½" 5" x 9" Condensers	5,450
FR-10 11 mm. ....	80	6" diam. Aspheric Condensers	5,700
FR-10 13.6 mm. ....	120	6" diam. Aspheric Condensers	10,200

#### Selected Technical Glossary

Appended hereto is the fourth and final installment of the selected technical glossary promulgated recently by the Academy of Motion Picture Arts and Sciences. It has been pointed out previously that there will inevitably be differences of opinion and recognized practice in the application of many terms, and therefore users of the glossary are cordially invited to call to the attention of the Technical Bureau of the Academy errors and suggested additions, so that by periodic revision the glossary may be kept authoritative and up-to-date.

The first installment of this glossary appeared in the March issue.

#### Q

**QUALITY.** That characteristic of sounds, produced by some particular instrument or voice, by which they are distinguished from sounds of the same loudness and fundamental pitch, produced by other instruments or voices.

**QUARTZ** lenses transmit ultra-violet light (to which most glass is opaque) and therefore have high speed; but the images are soft, so that such lenses are unsuitable for obtaining sharp detail.

#### R

**RACK.** Frame upon which film is wound for tank development.

**RADIO FREQUENCY.** Any frequency above about 10,000 cycles per second.

**RAINBOW NEGATIVE.** An **ORTHOCHROMATIC** (more sensitive to green than normal orthochromatic negative), dyed red.

Used as the front negative in **MULTICOLOR** photography.

**RAISE.** Opposite of **DROP**.

**RATTLE, LOUDSPEAKER,** is sometimes heard in reproduction due to the vibration of an element within the loudspeaker unit, usually occurring when the sound volume is large.

**RAW.** Of positive or negative film, means unexposed.

**REACTANCE.** An electric circuit opposes a varying current not only by virtue of resistance, but also by virtue of its tendency to oppose the variation in the current. Reactance is a measure of this latter tendency. It involves no loss of energy, but simply causes a displacement in time between variation in voltage and variation in current. Reactance is of two sorts: inductive reactance, due to inductance; and capacitive reactance, due to changes of electric charge in any condensers which are in the circuit. The greater the frequency of a c the greater the inductive reactance of the circuit, and the less the capacitive reactance.

**REACTOR.** High-inductance coil. See **INDUCTANCE**.

**REAL IMAGE.** See **IMAGE, REAL**.

**RECORDER.** (1) Apparatus for recording sound. (2) Essential element of such an apparatus. (3) Sometimes used for **RECORDIST**.

**RECORDING AMPLIFIER.** The **POWER AMPLIFIER** used to operate the sound-recording device (wax cutter, Aeolight, light-valve, or Photophone galvanometer, as the case may be.)

**RECORDING DRUM.** Drum over which the film runs as it is exposed in the recorder.

**RECORDIST.** Person engaged in recording sound.

**RECTIFIER.** Apparatus to change alternating to pulsating current.

**RECTILINEAR LENS.** Lens which produces undistorted images of parallel lines.

**RED LIGHT.** (1) (Red Bull's Eye). In

(Continued on page 37)

#### Lester Cowan Appointed M. P. Academy Executive Secretary

Appointment of Lester Cowan as Executive Secretary of the Academy of Motion Picture Arts and Sciences was announced following a recent meeting of the Board of Directors of this organization. Cowan's official title has been that of Assistant Secretary, but since the resignation of Secretary Frank Woods to accept a



Lester Cowan

studio post, the former has been discharging the duties associated with the executive post to which he now has title.

Since his association with the Academy in 1928 Cowan has compiled a remarkable record which reflects his enterprise, efficiency and thoroughness. Among numerous other activities, including important work in connection with the establishment of standard contracts between motion picture workers and producers, Cowan has done yeoman work in connection with the formation and functioning of the technical phases of the Academy's work. In addition he has supervised the planning and execution of an educational program which has already done much good for the motion picture industry.

#### Fine Work on S. R. P.

Of particular interest to projectionists is the fine work of Cowan in the matter of the establishment of the Standard Release Print. Acting for the Academy, and thus for the production interests of the industry, he secured the active support of every projection improvement agency for the S. R. P. and successfully launched a technical improvement which constitutes the most important advance in projection technique in many years.

This work on the S. R. P. has gained for Cowan a host of friends in projection circles and has in turn made his work in the interests of the entire industry of tremendous value.



## New Equipment and Appliances

### New Syncrofilm All-A. C. Sound Equipment

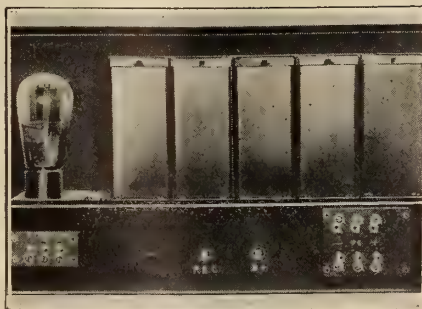
**A**N entirely new completely A.C.-operated power supply has been developed by the Weber Machine Corporation for their Syncrofilm sound equipment. These supply units were engineered and designed for the elimination of all batteries from new Syncrofilm sound reproduction equipment, and for replacement of batteries in use with equipment installed. They are made in two units, and consist of an "A" unit for the supply of smooth uninterrupted current to exciter lamps, and also for the filaments of the head amplifier tubes; and a "B" unit for supplying correct plate voltages to the head amplifier tubes and photo-electric cells.

The "A" unit is equipped with two 6-amp. rectifier tubes, in connection with a brute filter system, which effectively smooths out the ripples and delivers practically pure direct current. An automatic relay is included in the circuit, which functions to maintain a constant output voltage by cutting in an equalizing resistance when the fader is at the zero position, and by this means maintaining a constant voltage supply to filaments of the head amplifier tubes. Provision has also been made to compensate for various A.C. line voltages at the supply terminals on the panel. The 10-volt D.C. output is controlled by means of a panel mounted rheostat, a voltmeter, also located in the panel, at all times indicating the voltage supply.

The "B" unit is equipped with a very efficient multi-stage filter system, in connection with a standard 280-type tube for rectification. The output is practically pure direct current for tube plates and photo-electric cells. In this unit, provision has also been made to adjust for various A.C. line voltages at the input terminals on the panel. Separate voltage control has been provided for each photo-electric cell circuit, which facilitates the adjustment for correct operating voltage for any photo-electric cell. Separate controls have also been provided for required variations in the overall gain of the head amplifiers.



"A" supply



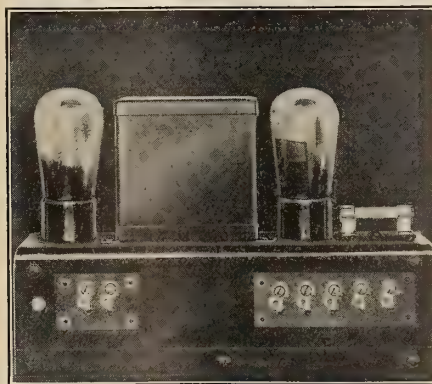
"B" supply

Head amplifiers have been specially engineered for use with these new supply units. These are two stages, high gain, and using two standard 227-type tubes. The frequency characteristics are excellent, the curve being almost flat from 50 to 10,000 cycles, faithfully reproducing speech and the full musical scale.

All units are ruggedly built, on pressed steel chassis, and are supplied with ventilated steel cabinets for wall mounting. The entire assembly and wiring of the component parts make a compact and efficient unit, the method of wall mounting having proven very desirable in projection rooms where the floor space is limited.

### New Portable Sound Picture Equipment by Bell Corp.

A portable sound picture equipment embodying several unique devices has been announced by Bell Equipment Corp., which has opened offices and showrooms at 729 Seventh Ave., New York, with F. H. Smith in charge as sales manager. The requirements for equipment of this type, according to Bell, are (1) It must be dependable and give a high quality of reproduction; (2) as fire-proof and as safe as human ingenuity can make it; (3) the price must be within the range of the field; (4) the equipment must not require too much space and must be readily portable; and, (5) the operation of the equipment must be simple



A.C.-operated head amplifier

and fool-proof, the construction rugged to withstand being transported.

This equipment has many features to recommend it. The film runs over an idler roller which is connected to an automatic circuit-breaker. Under normal operating conditions, with the film in the projector, this idler holds the motor and lamp circuit "closed." The automatic dowsing, or fire-shutter, is also connected to a circuit-breaker which controls only the lamp circuit by means of a governor. If film is in the machine and the lamp switch is turned to the "on" position, the lamp will not light until the projector has attained full speed, at which time the governor moves the dowsing out of the path of the light and turns the switch to the "on" position. With this arrangement if the film runs out or breaks, the lamp and motor circuits are instantly broken and the entire unit is stopped. This eliminates fire hazards due to film breakage.

#### Rear Shutters Employed

Rear shutters, effecting a heat reduction of 40% are standard with this equipment. The movement employed is of the continuous rotary type, which has all the advantages of the star and cam intermittent without the latter's disadvantages of short life and delicate adjustment.

The lens is of a very large diameter, 2 9/16 inches, giving a maximum of brilliance and definition to the screen. A triple belt drive is used as a quiet but positive power transmission, and all belts are adjusted by turning a screw on the exterior front of the projector. There are no idlers and the belts may be tightened while the projector is in operation. Any one belt will operate the machine; hence, the show will never be paralyzed by belt breakage. Only endless belts are used.

#### Rapid Record Oscillograph

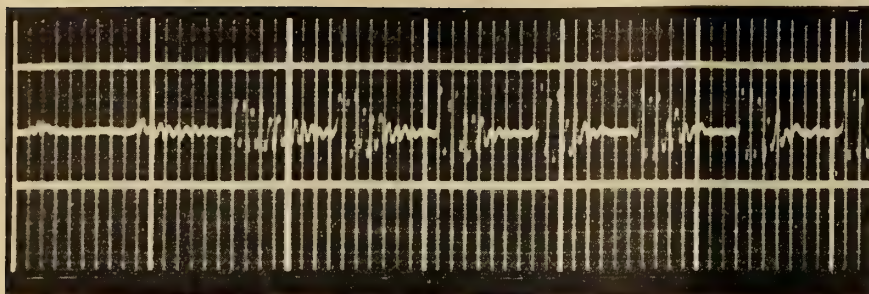
The recording oscillograph is the stethoscope of the sound engineer. Just as accurate diagnosis precedes the doctors' prescription, the scientific control of sound in its infinity of complex combinations is dependent on a means of analysis and evaluating its components. Such analysis must be made easily, quickly and accurately.

The rapid record oscillograph recently developed by the Bell Telephone Laboratories and now in use by the Acoustic Consulting Department of Electrical Research Products in its acoustic work fulfills these requirements in the form of a permanent photographic image of any sound picked up by the associated microphone. Pure tone or complex frequency from 30 to 6000 cycles is recorded on a graduated strip of paper, 35 mm. in width, the coordinates of which indicate directly the frequency, pressure and duration.

#### Use for Sound Analysis

In its application to sound analysis, the output of the associated micro-





"Nerves" as recorded by the voice oscillograph

phone is impressed on the string of a specially designed galvanometer. The string is of duralumin less than .001 inch in diameter stretched between the poles of an electro magnet and tensioned to a definite frequency. Suitable attenuation at the point of natural resonance results in uniformly linear response. Transient currents from the microphone passing through the string cause it to vibrate in proportion to the amount of impressed energy. Three such strings provide means for simultaneously recording data from as many sources, but any of the galvanometer strings may be used independently of the others.

By means of a very simple optical system and a tungsten lamp as a source of light, the shadow of the vibrating string is projected upon a moving strip of sensitized paper. In a similar manner, abscissa lines are projected on the oscillogram from a screen of parallel lines engraved on the optical system. Ordinate lines are obtained from the projected shadow of the spokes of a synchronously rotated wheel and represent time intervals of .001 second. The shadows of the strings and coordinate lines appear on the developed oscillogram as white lines, strongly contrasting with the dark grey of the portions which were exposed to direct light.

#### Photographic Mechanism

The photographic mechanism is essentially a complete camera and laboratory where the sensitized paper is exposed and passed through the developing and fixing solutions automatically. The speed of the paper through the light beam may be set within very wide limits, but at its maximum approaches a rate of 15 miles per hour. As this is much more rapid than the permissible rate of processing, it was necessary to provide intermediate storage for the exposed paper. This is accomplished by a light-proof storage tank where it is loosely folded until automatically withdrawn by the conveyor belts leading it through the process tanks.

The average oscillogram is available for inspection within one-half minute from the time the exposure trigger is released, and if it is wanted for further reference or enlargement may be completely dried within fifteen minutes. Extreme sharpness of the image makes possible enlargement to four or five times original size for minute inspection where desired, but this is seldom found necessary.

In the study of sound, the rapid oscillograph has proven extremely useful. It has simplified the scientific

analysis of interference phenomena and distribution of sound energy because of the ability to record simultaneously the initial sound at its source and the resultant sound energy received at widely separated locations in the auditorium. It thus becomes an instrument with which the acoustical engineer may qualitatively inspect reverberation characteristics while relying on the reverberation meter for a more complete and detailed study.

Absence of distortion and extreme simplicity of operation have developed useful applications of the rapid oscillograph in many fields. For investigation of sound recording and reproducing equipment, amplifier and tube characteristics and in all research where oscillograms of audio frequencies are desired, it has proved most useful.

#### One Operator for New G. E. Electron Tube Lighting Control

The first application in New York of electron tube control of theatre lighting will be made in the new Earl Carroll theatre at Seventh Avenue and Fiftieth Street, to be opened in August. The control, especially designed for the new theatre by the General Electric Company, eliminates the bulky back-stage switchboard and puts instant and accurate control of all lighting at the finger tips of a "lighting director" in front of the curtain.

Great quantities of light will be used. There will be 50 incandescent lighting circuits in all, 34 on the stage and 16 in the house, in addition to a large number of arc lighting circuits. Each incandescent circuit will govern a group or arrangement of lights and, in addition, there will be control circuits governing the various colors in these groups. Color master controls will be provided for both house and stage by means of which the various colors may be governed independently, and the various color controls will also be arranged for unit control from a grand master controller. There will be grand master controls for both stage and house; appropriate "black-out" switches for any or all colors, and a single master "black-out" switch for both house and stage. Another feature will be the black-out control of the many arc spotlights both in the arc booth and the side bridges on the stage. Thus the lighting director will be able to black these lights out at will as well as the other theatre lights, although the movement

of the spotlights, when necessary, to follow the movements of characters, will be under the direction of individual operators as usual.

In spite of the large amount of electricity involved for such a lighting project, the new method of control takes but a maximum of 200 watts, or four watts for each of the 50 pilot board control circuits. In other words, the control board does not handle large amounts of power directly, but through the medium of the electron tubes and the reactor system.

#### One Control Console

The lighting control console will resemble a desk with raised sides and back. In approximate dimensions it will be six feet long, five feet high and three feet deep. The operator will stand or sit at this console, viewing operations on the stage over the top. While one scene or action is taking place he will be arranging the lighting set-up for the following scene, and when the moment for change arrives, a flick of a switch will introduce the new lighting scheme, and the manipulation of knobs will vary the lights as required. A black-out may be introduced between scenes when desired by a similar operation.

The technical arrangement of the system is as follows: One side of the voltage supply to each light or group of lights will pass through one winding of a saturable core reactor. The other winding of this reactor will be fed by direct current in varying amounts from a Thyatron tube. The amount of rectified current supplied by these tubes will depend on the electrical relationship between the elements of each tube, and this in turn will be determined by the manipulations of the lighting director. As the amount of direct current fed by the tube to the reactor varies, the impedance of the reactor to the lighting supply load will vary, from a point where the lights are out, to full brilliancy.

By manipulating the knobs on the individual circuits, the lighting director could control the lights, but this would involve the operation of a possible 50 knobs—one for each circuit. By the use of master controls it is possible to govern all the lighting circuits through one knob, or to split the control into major and minor divisions, depending on color, location and function, each group in turn controllable through the agency of a variable resistance.

#### B. & S. 3-Lens Turret

The Basson & Stern 3-Lens Turret will accommodate 3 lenses of any size necessary for the presentation of sound-on-film, disc or silent, or Mag-nascope. Each lens has a separate focusing device, and there are also provided adjustments for up-and-down and sideways movements of each lens, thus insuring exact line-up of picture on the screen without it being necessary to shift the projector. The makers of this turret stress the fact that exact position register is possible with this turret.



## Everyday Science

### 2,600,000-Volt X-Ray Drills 1-Inch Hole in Brass

**H**ARNESSING the electricity of thunderstorms to a new type X-ray tube that promises to produce X-rays more penetrating than any radiation previously made by man will soon be accomplished by two German physicists, Dr. F. Lange and Dr. A. Brach of the University of Berlin, according to a paper read before a recent meeting of the American Association for the Advancement of Science. Sixteen million volts have been captured from storms that played around twin mountain peaks on the Italian-Swiss border, where the Germans set up a device for capturing electrical potential.

In their Berlin laboratory the two scientists built a new type of compact X-ray tube made of rubber, paper and aluminum. It was tested to 2,600,000 volts, which is believed to be a higher potential than that of any existing X-ray tube.

The 2,600,000-volt tube is less than three feet long, yet speeding electrons within it drilled holes an inch deep in a brass plate within the tube. X-rays produced penetrated a tower of lead a foot thick and retained their ability to affect a photographic film. More than 200 alternate layers of rubber, paper and aluminum formed into hollow rings of various sizes compose the new X-ray tube, which is held together in a press. A new tube is now being made to be used at mountain atmospheric high potential station, and it is hoped to produce there X-rays of at least 8,000,000 to 16,000,000 volts.

In Summer and early Autumn on their mountain the two Germans discovered that they could use the induced current from thunder storms several miles away and so could use their natural electrical generator every day. Between the two mountain peaks they stretched a hemp rope with 120 insulators. From this there was suspended into the valley a wire for gathering electricity. This ran to a spark gap which produced fifty-five foot sparks of 16,000,000 volts. Such discharges will be passed through the new X-ray tube.

#### Applied to Cancer Treatment

The 16,000,000-volt X-rays are expected to be as powerful as some of the cosmic rays received from outer space and thus promise to aid in the solution of the nature of those rays. The report from Berlin indicated that it was planned to use the X-ray tube of new design for the treatment of cancer.

### New French Camera Takes 3,200 Views a Second

A fast motion picture camera, capable of taking between 2,000 and

3,200 views a second, has been invented by French scientists. The camera was demonstrated for the first time by Dr. Mangan, professor in the College de France, and his collaborator, Dr. Huguenard, assistant director of the Ecole des Hautes Etudes.

Flies beat their wings 90 times a second, and small birds go almost as fast, the professors showed in demonstrating their camera and projector before the Academie des Sciences. This new camera will be of great value to scientists and also to aviators. It will be possible for the life stages of microbes to be studied by 2,000 views a second, and some of the secrets of birds' flight can be solved for the benefit of human flyers. The growth of human hair, such as mustaches, likewise can be photographed and thrown on the screen for all to wonder at.

By using a narrower film than usual and a much faster shutter over the lens, the camera takes up to 3,200 views a second. Ordinary cameras now do only 250. In addition, the professors were able to speed up their shutter and obtain impressions of light at 6,000 views a second.

### Heat and Cool Homes by Gas

According to Eugene D. Milener, Industrial Research Representative of the American Gas Association, it will soon be possible, through the aid of gas, operating one piece of machinery, not only to heat the house to 70 degrees during seven or eight months of the cool season, but also, to keep the temperature down to 70 degrees during the hot season, and at relatively small increased expense.

Mr. Milener points out that one of the most important factors in comfort in the home is the amount of humidity. In the winter a lower inside temperature is comfortable when the proper amount of humidity is contained in the air; and likewise in summer, if the amount of humidity is reduced, the comfort is measurably increased.

#### Utilize the Air

By means of a gas-fired heater and a silica gel absorption refrigeration unit, not only is the house heated, but the refrigerator is kept cold during the winter; and in the summer, in addition to keeping the refrigerator cold, the same machine, by dehydrating the air and at the same time cooling it, makes possible a constant temperature of clean, pure air through the day.

The operation of such a plant requires little or no attention, as it is

entirely automatic and controlled by means of a thermostat which can be easily set by hand at any desired point.

Such a system contemplates the use of air as a heating and cooling medium rather than steam or hot water. Positive circulation is secured by means of an electrically operated forced draft fan. The air is filtered before being heated and humidified, so that a constant supply of fresh clean air of the right temperature and humidity is pumped into the rooms.

### Gas Substitutes for Hydrogen

A new gas for industrial use, which has been named electrolene and is claimed to be better than hydrogen in many industrial applications, is produced by feeding a combination of steam and manufactured gas, or other hydro carbons, into an electric cracking device recently developed. This new gas can be made for about one-tenth of the present cost of hydrogen, and is expected to be of especial value when used in electric furnaces with controllable atmospheres, in such processes as heat treating, brazing, etc., and also an application in the hot cutting of metals.

In the cracking processes to produce the gas, the necessary heat is generated by electricity. The apparatus is neither large nor complicated. The amount of floor space is small and the attention required is not great.

### Autos Lessen Earthquakes, Houses Magnify Them

Automobiles are cited as "admirable earthquake-proof buildings," by Dr. T. A. Jaggar, distinguished American volcano expert, as a result of personal experiences during the severe earthquake of September 25, 1929, in Hawaii. In a recent announcement from the Hawaiian Volcano Research Association, Dr. Jaggar describes how he happened that day to be driving in his automobile to visit a friend. On arriving at the friend's house, Dr. Jaggar was astonished to find the inhabitants in great excitement and the house partly ruined. A violent earthquake had happened while Dr. Jaggar was in his moving automobile. In spite of long experience as an earthquake observer he had felt nothing.

During the shocks which followed, Dr. Jaggar reports, many people left their houses and slept in their automobiles. Even when not in motion, Dr. Jaggar reports, "a sedan on springs and rubber tires produced almost no sensation to the occupants



while adjacent homes were rattling and roaring with the aftershocks."

Houses usually act, he finds, as magnifiers of earth movements so that what seems to be a violent earthquake to a person indoors may seem to a person on the ground in the open to be a single, not very strong, thud under his feet or may pass altogether unnoticed. This may explain why it is that primitive men have few myths of earthquakes but many of floods and fires. Having no houses to magnify them, primitive man probably felt only the very greatest earthquakes, but anybody is impressed by a forest fire or a flood.

## The Measurement of Light

Photometry is the art of measurement of light and the comparison of different sources of light. Light is a physiological, rather than a physical quantity and cannot be measured in terms of any absolute system of measurement. The measurement of illumination or light is therefore based upon arbitrary standards. Formerly the standard of light measurement was a candlepower, made according to certain standards and used in a certain way. The manipulation of these standards required much care in order to assure that results would be at all correct. Flame standards of this kind are still used to a certain extent, but for all practical purposes carefully seasoned carbon filament lamps are preferred. These secondary standards are rated in international candles, which is the recognized unit in most countries.

There are many types of photometers but most of them employ one of the three principles herein described. In all of them it is necessary to compare illumination by means of the eye and this introduces a certain error, since it is seldom that two observers will see things exactly alike.

## Illuminating Terms Defined

**Candlepower.** This term as commonly used denotes the light giving power of a lamp. Unless qualified by one of the following terms, such as hemispherical, apparent, etc., its meaning is very loose, as the candle power of most lamps varies greatly at different angles.

**Apparent Candlepower.** This term is generally applied only to lamps equipped with special concentrating reflectors which limit the light to a small area. This rating is usually given for a specified distance in feet. The value of the apparent candlepower depends more upon the reflector than upon the lamp.

**Equivalent Candlepower.** This term is used in referring to lights such as the Moore tube or mercury vapor lamp, the light of which is emitted from a large area rather than from one point. It means that the total light emitted from such a source

is equivalent to a point source of the stated mean spherical candle power.

**Maximum Candlepower.** This denotes the maximum intensity of illumination obtained in any direction from any lamp.

**Efficiency of Electric Lamps.** The term efficiency here is used in a manner differing from the ordinary use of the word. Ordinarily, efficiency is expressed in percentage of 1.00 and the nearer 1.00 the efficiency the more satisfactory is the statement. In illuminating the term denotes the number of watts per candlepower. Thus, an ordinary 16-candlepower old-type, carbon lamp requiring 55 watts would be considered as having an efficiency of about 3.5 watts per candlepower. Used in this way the term is as loose as is the use of the word candlepower without qualification. The efficiency of electric lamps may be properly stated either in lumens per watt at the terminals of the lamp or in watts per mean spherical candlepower.

**Foot Candle.** The foot candle is the common unit of illumination. It is the intensity of illumination produced by a source of light of one candlepower at a distance of one foot from that source, the light falling perpendicularly. In place of foot candle the phrase lumens per square foot is also used. The number of lumens per square foot and the number of foot candles will always be the same.

## Reversed Armature Coil

A trouble that may exist in an armature is a reversed coil. Instead of the armature winding progressing uniformly around from bar to bar of the commutator, at some point a coil may be connected backward. While a manufacturer should weed out such mistakes, they do sometimes occur, causing annoyance, if not actual trouble. Such a reversed coil often causes bad sparking.

A practical way to locate this coil

is to pass through the armature at opposite points on the commutator a current, and then with a compass explore around the armature, the direction of magnetism from slot to slot. If a coil is reversed when the compass comes before it, the compass needle will reverse, giving a very definite indication of the wrongly connected coil.

## Alternating Current Machines

Alternating current generators are built in two types, known respectively as revolving field and revolving armature. The common names of the two sets of windings are rotor and stator. The revolving field type machine is most commonly used because of the field current having only to pass through the brushes and collector rings and the high tension wires are all stationary.

Alternating current generators are separately excited. That is the field current is supplied from an auxiliary direct current generator known as an exciter. The current supplied from an opposite current generator alternates in direction at regular intervals and from this characteristic is derived the terms "frequency" or "cycles," which always has a numeral value which defines the period of the alternations. The most generally adopted systems operate at either 60 cycles, 7,200 alternations, or 25 cycles, 3,000 alternations.

While there are some central stations which supply 40-cycle, 50-cycle or 133-cycle current, alternating current is generated single, two or three phase. Two and three-phase systems are most generally used because of their being better adapted for the operation of large motors.

Alternating current motors are constructed single, two and three phase, and of many different types, and for all frequencies and synchronous speeds.

## Patents: *A series of instructive and interesting articles on how patents are obtained and sold.*

By RAY B. WHITMAN

*Note: In this series of articles Mr. Ray B. Whitman, practicing patent attorney of New York City, explains in understandable non-technical language, just what a patent is, how one is secured, and how it may be sold. In addition, Mr. Whitman offers to the readers of this magazine personal advice without obligation on any subject connected with patents, trade marks, designs, or copyrights. All inquiries should be addressed to Mr. Whitman in care of this magazine.—EDITOR.*

### II

#### What to Invent

THE inventor has the best chance of success who confines his inventive efforts to a field, or industry,

about which he knows something; such, for instance, as the one in which he earns his livelihood. Many of the patent failures are due to the fact, as someone has facetiously remarked, that "the Iowa farmer attempts to invent a new form of submarine or the Cape Cod fisherman, a new threshing machine!"

Again, invent something in line with your mental capabilities and your financial station in life. For instance, if you are an average citizen without too much money or technical knowledge, don't try to invent anything too complicated, such as a new form of gas-turbine to drive an auto-



mobile; for the experimental work and the cost of the first model necessary to determine the practicality of such highly technical machines, runs into tens of thousands of dollars, and this burden must often first be shouldered by the inventor before he can hope to get anyone to finance him further.

Incidentally, this very condition is often the salvation of the poor inventor, since it forces him to invent in those more simple fields, where perhaps most of the great fortunes have been made in invention. Speaking about the profits from simple inventions recalls the case of the Cedar Rapids, Iowa, inventor of Eskimo Pie, who is said to have realized a royalty of as much as \$35,000 a week from merely putting a coating of chocolate on a piece of ice-cream. Then there was the shoe cobbler of Elyria, Ohio, with a fortune in seven figures, made in a few years, according to sworn testimony in court, from a rubber heel.

#### The Evidence of Conception

The cost of patenting and perfecting a simple invention is usually so little that any poor man can afford the risk, whereas with complicated and more technical conceptions, large sums must invariably be spent before even being able to determine if the subject-matter of the invention is of a useful or money-making character.

Having now conceived an idea which the inventor feels is valuable enough to go further with, he should, as the next step, protect himself against any one else, either unscrupulously or accidentally, proving priority of invention and the right to a patent. One way to do this is to prepare what is known as an "evidence of conception." The inventor writes a detailed description of the complete invention in his own words, on a typewriter or with pen and ink; and makes also any necessary rough sketches to illustrate the invention (unless it be a chemical process or like invention where this is impossible). On the last page he affixes his name and the date, either in the presence of two witnesses, preferably persons outside his family, or better, before a Notary Public, who will attest his signature as of that date, and affix the notary seal. This original document should always thereafter be retained by the inventor with other valuable papers. If it has been prepared on the typewriter, which is preferable, a carbon copy should be made and used to submit the invention to his attorney later.

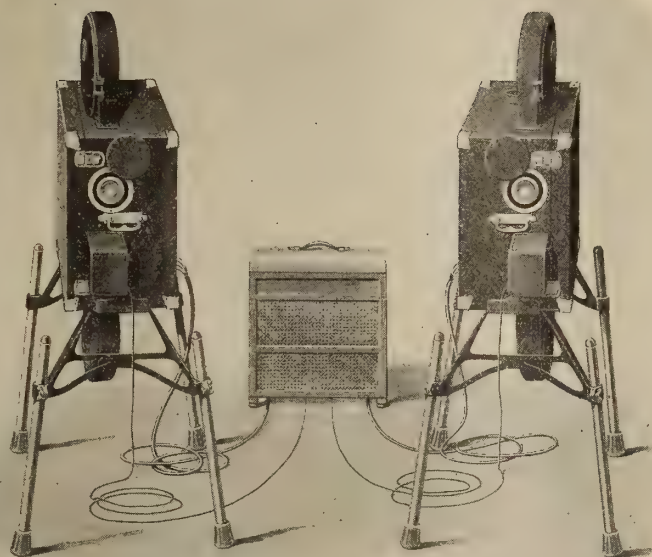
By this simple means, the inventor is always able to prove first conception of his invention at the date noted, and this is often of great importance, for many times others are inventing in the same field and without knowl-

edge of their competitors' activities. Occasionally, too, where attempts are made to improperly appropriate the inventor's idea, he is able later on to substantiate his prior rights to the invention and a patent thereon.

Such an instance as this last occurred to a client of the author, who won a suit on a phonograph motor patent that went up to the Supreme Court, largely upon an evidence of conception which he had written informally on the back of a dance program, but which he had been careful to properly sign, date and witness.

#### Other Records Desirable

It is highly important also that the inventor maintain a similar record in writing, properly dated and witnessed, giving other information which also may be needed later, including: (1) the date that the invention was first disclosed to others, with their names and the circumstances of the disclosures; (2) the date when the first sketches and working drawings were made—the drawings themselves to be suitably signed, dated and witnessed; (3) the date when the first operating model was made, together with information as to who made it, and the original bills for material, where obtainable; and (4) all the models themselves, made during the development of the idea, should be carefully preserved. All this data enters into a



## BELL PORTABLE TALKIE EQUIPMENT FOR 35 MM. SOUND-ON-FILM

Built from the ground up . . . to meet the demand and requirements of the Educational and Industrial and the Amusement fields . . . Bell specializes in portability, maintaining a standard of quality.

All gears run in a bath of oil. All parts are automatically lubricated.

The projector is automatically stopped and all current shut off when the film has run through the machine.

The rugged construction and rear shutter design permits a maximum of operation with a minimum of heat, and permits standard showings up to an audience of 1500 people.

THE BELL SINGLE or Industrial Unit is provided with 1000 ft. or 2000 ft. reels and magazines, and consists of one right projector, 5 stage Amplifier and Uni-Remote-Control, mounted in metal case and two dynamic speakers mounted in carrying case. The total weight is 150 lbs. complete with legs, carrying cases and accessories. Price, \$1250 complete.

THE BELL TANDEM Unit is designed in right and left projectors and can be set up with 18" between lenses or 20 feet apart. The Uni-Remote-Control of exclusive BELL design provides smooth "change-over" and individual operation of either projector. The BELL Tandem Unit consists of one right projector, one left projector, 5 stage amplifier and Uni-Remote-Control mounted in metal case and 2 Dynamic Speakers mounted in carrying case. The total weight is 215 lbs., complete with legs, carrying cases and accessories—Price, \$2150 complete, F.O.B. Factory, Derby, Conn.

Write for Distributor Plan

Demonstrations by appointment at our New York Showroom



**BELL EQUIPMENT CORPORATION** *Portable Talkie Equipment*  
Suite 605 . . . 729 Seventh Avenue . . . New York

Phone BRyant 9-9890

FACTORY—Hershey Metal Products Co., Derby, Conn.



## AN IMPROVED METHOD OF BLOCKING OUT SPICES IN SOUND FILM

**N**OW the sound track need no longer be painted out at the joints to silence splice noise. The Eastman Sound Film Patch enables the laboratory worker to block out joints with greater ease, speed, and uniformity.

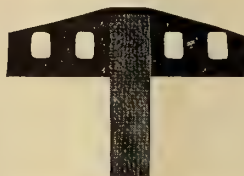
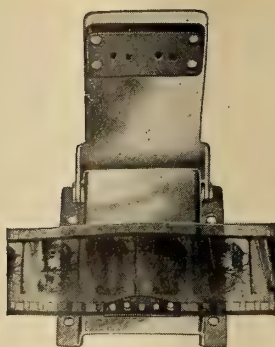
The patch is made of light-weight, opaque film. For convenience in handling, it is provided with a quickly detachable finger tab. With the aid of this tab, a simple but accurate registration block, and cement, the patch is quickly applied to the film.

Because of its design, the patch is practically inaudible in projection. At the same time it obscures a minimum of the sound record, and assures fast, accurate treatment of all splices. These factors make the patches and the block a valuable feature of Eastman Service.

Eastman Sound Film Patches, per thousand . . \$5.00  
Eastman Sound Film Patcher (registration block) 4.25

**EASTMAN KODAK COMPANY**  
ROCHESTER, NEW YORK

J. E. Brulatour, Inc., Distributors  
New York Chicago Hollywood



proper prosecution of what is called an "interference," in which the application for patent sometimes becomes involved.

The inventor having now established his or her "evidence of conception," may take the next step, which is:

### Finding a Good Attorney

There are 12,000 or more patent attorneys registered to practice in the United States Patent Office, and of these probably 2,000 get most of their income from the preparation and prosecution of patent applications, and their exploitation and litigation. These men are all professionally-trained men, and, with perhaps some rare exceptions, honest and ethical in all their dealings. However, they, like doctors, dentists, or other professional men, vary in their degree of ability or skill.

### Patent Attorneys to Avoid

Some attorneys are too young and with too limited experience or education to understand fully how to properly protect a valuable invention. Others are too old to be at the height of their mental power, or not aggressive enough in combating the Examiner's objections, during prosecution of the case, to obtain all the protection that the inventor is entitled to.

Some attorneys get their clients through advertising methods, and instead of conducting a professional practice, work on the "once only" plan, getting the maximum possible fees from the inventor for the minimum allowable work. Needless to say, this latter class of attorneys do their work so poorly that their patents are usually of little or no practical value.

Other patent attorneys devote most of their time to court litigation, and very little to Patent Office practice, or the preparation and prosecution of patent applications into patents. So they have little real skill in such work, and especially in the drafting of the "claims" in patents, which is the important and really protective part of these legal documents, of which more hereafter.

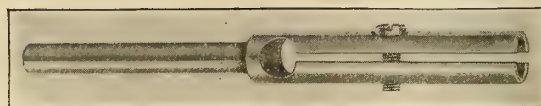
Again, many patent attorneys are merely lawyers, with but little knowledge of the sciences or engineering, and so are seriously handicapped in patenting inventions, especially if they are very technical.

*(To be continued)*

### Technicolor Film Improvement Shown by Studio Tests

Technicolor films have been developed to an equal efficiency basis with black and white films, it was revealed recently by a series of exhaustive tests conducted at the Radio studios in Hollywood, where two all-Techni-

## BEST CARBON SAVER FOR LOW INTENSITY LAMPS



Saves jaws of Lamp as well as Carbon. Made in all sizes.

\$2.50 each at your dealer.

**BEST DEVICES CO.**

200 FILM BUILDING

CLEVELAND, OHIO



### Action of Light on the Eyes

THE human eye is the only part of the body which does not grow stronger (as far as resistance to physical impact is concerned) as we grow older. A 200-pound chipper's eyes are just as sensitive as a two year old baby's. The cornea of the eye is the window in the otherwise white eyeball. It is made up of five layers with a total thickness of  $\frac{1}{25}$  of an inch. The outer coat is highly polished and quite tough. When this outer coat is injured or penetrated, exposing the tender layers, serious results are almost sure to follow.

Back of the cornea is the anterior chamber filled with a fluid much like water. If the eye is penetrated deep enough to let the fluid out, the eye ball will collapse and blindness will result. Next is the iris, the part that gives the color to the eye. It is a small circular muscle with an opening in the center forming the pupil through which light passes. The iris expands and contracts to control the amount of light entering the eye.

### Function of the Lens

Next comes the lens, which is a clear semi-solid substance surrounded by a ring of muscles. The lens is very elastic and increases or decreases its focal power as the muscles contract or expand. The large area back of the lens is the vitreous chamber and is filled with a jelly-like sub-

color productions have recently been completed. Wedding the improved Technicolor printing process with the new super-sensitive film, faster lenses, new make-up, and an innovation in set painting, the following discoveries of much importance to the film industry were made:

1. That color films can be produced at almost one-half the old cost, as the result of the recent price reduction of Technicolor prints to seven cents a foot.
2. That a large item of expense—electric current for lighting of sets—can be reduced 40 per cent because of a decreased need for extreme lighting.
3. That color can be reproduced naturally, without flickering fringes or overlapping and without tiring the eyes.

4. Also that the faster lenses permit a clear color definition in both close-ups and long-shots which was impossible formerly.
5. That creditable color reproduction is obtainable with normal outdoor lighting, such as might be used in photographing black and white subjects.
6. That sensitivity to extreme color opposites is heightened 100 per cent., allowing for a more natural coloring of sets and costumes.
7. That make-up tests disclosed a decreased need for rouge on the faces of stars and permitted a more natural facial coloration.

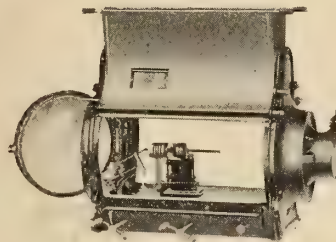
The experiments at the RKO-Radio studios were conducted in association with Technicolor experts by Max Ree, art supervisor; Ernest Westmore, make-up chief; and Kay Rennahan, Technicolor cameraman.

## Fill This Prescription and Cure Your Light Troubles

**Rx**

# STRONG

HIGH INTENSITY  
AUTOMATIC REFLECTOR  
ARC LAMPS



Provide the extra light necessary to the proper projection of talking pictures and produce no foreign noise because of the continuous arc feed.

For Sale By Independent Supply Dealers

## The Strong Electric Corporation

2501 Lagrange St., Toledo, Ohio

Export Offices: 44 Whitehall St., New York, N. Y.

KEEP all your COPIES of  
MOTION PICTURE PROJECTIONIST  
AS A REFERENCE FOR CURRENT  
AND FUTURE NEEDS—PRE-  
SERVE THEM IN A  
BINDER

**\$2<sup>00</sup>**  
**each**

GOOD SOLID  
IMITATION LEATHER  
—GET ONE

ORDER FROM THE MOTION  
PICTURE PROJECTIONIST



## Good Projection Requires Good Rectification



M. P. 25-25

## Good Rectification Means FOREST RECTIFIERS

**T**HIS Forest Rectifier meets the demand for a single unit to supply direct current for two projectors, and will furnish 15 to 25 amperes to either projector continuously.

It supplies a steady direct current, free from pulsations, and will produce a better light than other current supply devices. The only wearing parts are the bulbs which will last at least one thousand hours and usually much longer since only two bulbs are being used at a time (except during change over) and the load is alternately carried first by one set of two tubes then the other two as the projectors are alternately used.

This Forest Rectifier embodies the use of four rectifier tubes which are connected to supply current to two direct current circuits independent of each other, thus preventing loss of current at the first arc when the second arc is struck.

Both arc can be operated at the same time during the change over period and there will be no diminishing of the light from one projector while lighting up the second.

Two Ammeters are mounted on the unit which will show at a glance the amperage being used at either arc.

Links are provided for operating from 110-220 or 240 volts.

Rectifiers for all purposes made in 15 amp., 25-25 amps., 30, and 65 amps. sizes.

*We are specialists in our field. Send us your technical problems. Literature on request.*

### FOREST ELECTRIC CORP.

New and Wilsey Sts.

Newark

N. J.

stance. Nature has made no provision for renewing this vitreous. If an injury causes loss of any part of it, total loss of vision results.

Next is the retina and optic nerve. The retina is the screen where the picture is focused by the lens. The image is then transferred through the optic nerve to the brain.

The exposed part of the eye is protected by the eyelids, which cover it almost instantly when danger approaches. They are not fast enough, however, to keep a piece of emery or chip of steel from entering and causing injury. The lining of the eyelid is very sensitive and easily injured or infected.

The muscles of one eye are very closely connected by nerves to the other, so that in any eye movement they can act together. When the eyes are turned to the right, the outside muscle of the right eye and the inside muscle of the left eye work together—so it is with any eye movement. There is no instrument or machine which approaches the eye in its fineness of adjustment and operation.

### Effects of Defective Vision

Defective vision may be described as an eye out of adjustment. In all cases where it is possible, the muscles adjust to this condition and correct the defect. If they are forced to do this constantly they become tired. This condition is termed "eye strain."

A person with normal eyesight has the ability to judge distance and accurately estimate movement and speed. One who has only one eye or

very defective vision does not possess this faculty, but has to estimate distance and space by relation of objects with which he is familiar—estimate speed by his other senses and carefully regulate his movements in unfamiliar surroundings. He is then a hazard to himself and to others if forced to work in hazardous occupations.

The rays of light which produce vision are violet, indigo, blue, green, yellow, orange, and red. These are all contained in sunlight. Color of objects is determined by the rays reflected from the object to the eye. If sunlight, which contains all colors, is reflected from grass, we see grass green, because all the rays are absorbed but the green. We use light reflected from the object to form the picture. The iris adjusts the size of the pupil to admit the proper amount of light. Too much or too little light causes discomfort. Green and yellow-green are the easiest colors on the eye. The reason for this is that most objects in nature contain these colors. Man-made conditions are much harder on the eyes than nature's.

### Harmful Light Rays

Ultra-violet and infra-red rays are found in sunlight. These rays are not used for sight and are quite harmful to the eye. However, we get very little sunlight directly into the eye and these rays are not reflected in harmful quantities from most of the objects we look at. Ultra-violet, a high-frequency light, penetrates the eye to the retina causing severe injury. A few seconds' exposure at close range to an electric arc may cause blindness—these and several other sources of ultra-violet, such as electric arc furnaces and oxy-acetylene flame. Care must be taken to protect men who work around any of these hazards.

Infra-red or heat rays are also dangerous, but work more slowly. Few of these rays reach the retina, but they do great injury to the cornea, iris, and lens of the eye. Infra-red rays are present in dangerous quantities in any combustion or incandescent body over 1800° F. The higher the temperature the more harmful they be-



## TEST THIS OUT FOR YOURSELF



Try out a Visitron. Compare it with any other Photoelectric Cell on the market . . . You'll HEAR the difference; and you'll continue to get better sound reproduction from Visitrons long after other cells are worn out. Look for the name on the back of the metal plate. Get Visitrons at your nearest National Theatre Supply Company Branch.

# V

PHOTOELECTRIC CELLS

## VISITRON


REG. TRADE MARK

**G-M LABORATORIES INC**

1733 BELMONT AVE. CHICAGO, ILL.

### THEATRE EQUIPMENT

NEW AND USED



Sound Equipment, Moving Picture Machines, Screens, Booths, Opera Chairs, Spotlights, Stereopticons, Film Cabinets, Portable Projectors, M. P. Cameras, Generator Sets, Reflecting Arc Lamps, Carbons, Tickets, Mazda Lamps and Supplies.

Projection Machines repaired and overhauled. Repair parts for all makes opera chairs. Attractive 3x10 ft. muslin banners, \$1.50; on paper, 50 cents.

**We Pay Highest Prices for Used Projection Machines, Opera Chairs, etc.**

**Everything for the Theatre—Write for Catalog K.**

**MOVIE SUPPLY CO., 844 So. Wabash, Chicago.**



come. Glare from incandescent bodies also produces irritation by admitting more light than the retina can stand. When furnishing protective glasses, ultra-violet, infra-red, and glare must all be considered.

No eye injury is a minor injury. Every foreign body is a potential serious injury and should be treated as such by a competent first aid man, nurse, or doctor.

## Selected Technical Glossary

(Continued from page 28)

certain studios, signal that everything is ready for the action to commence. (2) (Refers to small red light on the same panel as (1).) Signal that the recorder is ready.

**REDUCE.** In chemistry, refers to a chemical action such as the change of silver bromide to silver.

**REDUCER.** Solution for reducing the density of a photographic image.

**REDUCTION FACTOR.** Factor less than unity.

**REEL.** (1) Flanged metal spool on which film is wound. (2) Unit of motion picture length, about 1,000 feet of film. (3) Short play about one reel (2) in length.

**REEL, FEED.** See **FEED REEL.**

**REEL, SPIRAL.** Developing rack which holds the film in a spiral.

**REEL, TAKE-UP.** See **TAKE-UP REEL.**

**REFLECTING POWER** of a surface, is the ratio of reflected to incident intensity of light.

**REFLECTION, ANGLE OF.** See **ANGLE OF REFLECTION.**

**REFLECTOR ARC.** SEE **ARC, REFLECTOR.**

**REFRACTION.** Bending of a wave of sound or light when it passes from one medium to another of different intensity.

**REFRACTION, INDEX OF,** of a given material, is the ratio of the speed of light in a vacuum (or, for practical purposes, in air) to the speed of light in that medium. This index determines the amount of bending which light rays will undergo when entering or leaving the material. The greater the index (above 1), the steeper will an entering light ray be bent toward the perpendicular; on leaving, the ray resumes its original direction.

**REGULATOR, MOTOR.** See **MOTOR REGULATOR.**

**RELAY.** Device by means of which electric power in one circuit controls electric power (generally greater) in another circuit.

**RELOAD.** To replace an exhausted camera magazine or sound magazine with a full one.

**RELUCTANCE.** Opposition to magnetic flux.

**RE-RECORD.** To make one sound record from another, electrically. Cf. **DUBBING.**

**RESOLVING POWER.** Ability to distinguish detail.

**RESONANCE POINT.** Same as **NATURAL FREQUENCY** or **NATURAL PERIOD**, as the case may be.

**RESONATOR.** Body or circuit characterized by resonance, particularly one which has a variety of resonant frequencies.

**RETORT.** Same as **MAGAZINE.**

**RESONANCE.** Response of a vibrating body, or of an electric circuit, to vibrations impressed upon it, particularly to those which have the same frequency as a **NATURAL FREQUENCY** of the body or circuit. Vibrations at such a frequency tend to have a greater amplitude than vibrations at any other frequency; consequently the body or circuit re-radiates a comparatively large amount of energy at that frequency, and re-enforces any waves (sound or electrical, as the case may be) of that frequency which reach it.

**REVERBERATION.** Persistence of sound in an enclosed space, due to reflection from the walls.

**REVERBERATION, TIME OF.** Time required for a reverberating sound to die away to one one-millionth of the intensity of the original sound.

**REWIND.** To reverse the winding of a film, usually so that the end to be first projected shall lie on the outside of the roll.

**REWINDER.** Machine for rewinding.

**RHEOSTAT.** Instrument placed in an electric circuit to supply a resistance (generally a definite known resistance) variable at will.

**RHEOSTAT, FIELD,** controls the field current of a generator or motor, consequently controls the magnetic field acting, and thus regulates the output of the machine.

**RIBBON.** Refers to the loop of tape in a **LIGHT-VALVE.**

**RIFLE.** One bulb lamp with corrugated mirror reflector.

**RING, TUBE.** See **TUBE RING.**

**ROTARY.** An arc lamp in which carbon electrodes are revolved and kept at the desired distance apart by means of an auxiliary motor.

**rpm** Abbreviation for revolutions per minute.

**rps** Abbreviation for revolutions per second.

**RUNAWAY.** Abnormal speed of a motor at starting, due to some abnormal condition in its circuit.

**RUNOUT.** That part of the print from the last frame of the picture to the end.

**RUSHES.** Same as **DAILIES.**

**RUSTLE, VALVE.** See **VALVE RUSTLE.**

## S

**SAFETY FILM** has a base of acetate which is slow-burning, and so is less inflammable than ordinary nitrate film.

**SANDWICH FILM.** Either positive or negative film having two sensitive emulsions on one side of its transparent base, the two emulsions being separated by a sub-stratum of a transparent, or dyed, gelatin. Used in **MULTICOLOR** printing.

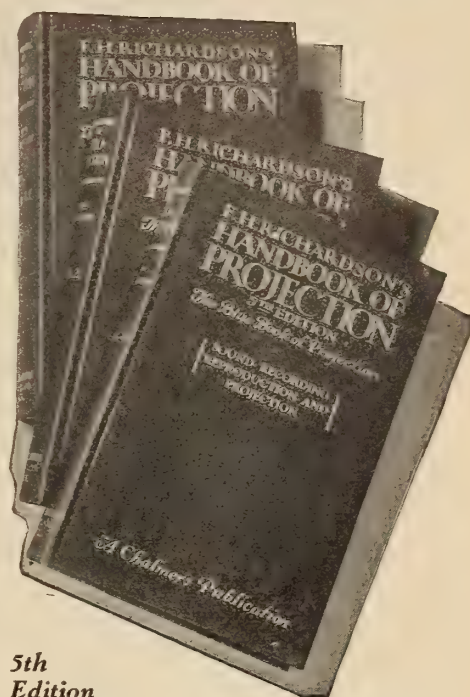
**SATURATION OF COLOR.** Ratio of white to **MONOCHROMATIC LIGHT** in a mixture which appears identical with the color in question.

**SCALE.** Portion of the density axis which corresponds to the straight portion of the **H** and **D** curve. A measure of the range of densities for which the constant value of gamma is valid.

**SCOOP.** Hanging or suspended **BROAD.**

**SCORING.** Preparation of a sound record

## THE BEST SELLER



5th  
Edition

## HANDBOOK OF PROJECTION

By F. H. Richardson

Back in 1910 Mr. Richardson wrote the first Handbook of Projection. It was a sell out. Second, third and fourth editions, each bigger and more successful have followed. The present fifth edition in three separate volumes, illustrated above, is the culmination of years of intensive effort.

Richardson is no swivel chair author. He knows the problems of the field—meets the men on their own ground. His books reflect a practical knowledge of just what information is needed. Recently he completed a 17,000 mile trip through the U. S. and Canada in the interests of projection.

## CONTENTS

Volumes I and II are devoted entirely to the general subject of projection and everything related to it. Volume III deals exclusively with sound projection. All three volumes are profusely illustrated and contain over 1,400 pages of projection information written so you can understand it clearly. Each volume contains Richardson's famous question and answer index giving immediate access to hundreds of different problems.

These are the books which are being used by projectionists and theatre managers all over the world to secure improved results. Send for this finest of projection libraries today.

## USE COUPON TO ORDER

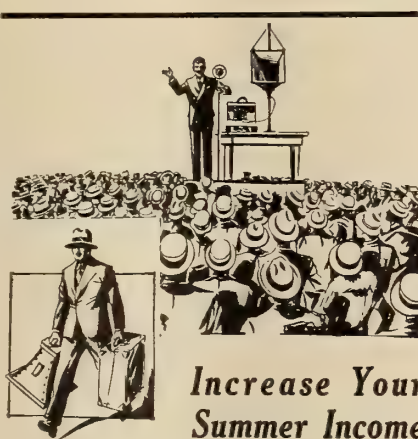
CHALMERS PUB. CO. (M)  
516 Fifth Avenue, New York, N. Y.

Enclosed find (check) (money order) for \$10.25. Send Richardson's 3 volume Handbook of Projection to .....

.....  
.....  
.....

## WINNIPEG, CANADA

J. M. RICE & CO., J. M. Rice, Prop. Leading equipment dealers in all kinds of projection room equipment facilities. Representatives of leading equipment manufacturers of the United States and Canada. All our merchandise guaranteed for performance and stability. Whatever you want we will supply it.



Increase Your  
Summer Income

Use your knowledge of sound equipment to

RENT OR SELL

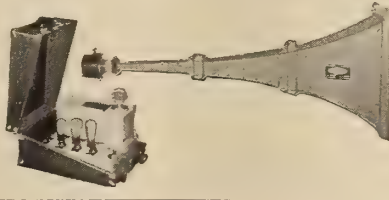
**Amplion Portovox**

A Big Public Address Set in Two Small Packages

Genuine Amplion Unit—Exponential Horn, Amplifier and Microphone

Address

**Amplion Products Corp.**  
38 West 21st St., New York

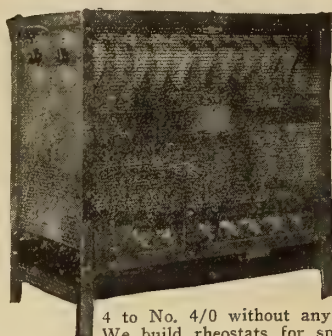




# Hoffmann-Soons

## PERFECTION

Good Will Can't  
Be Bought



It takes time and satisfactory product to gain the good will of any industry.

HOFFMANN-SOONS makes no exaggerated statements but gives the desired service for the present requirements of rheostats for sound motion picture projection. The **PERFECTION RHEOSTAT** has won the confidence of the motion picture industry and is considered the leader in its field.

### THE ONLY UNION MADE RHEOSTAT

Recognized as the Highest Standard everywhere

Now equipped with solderless, adjustable lugs to take wire sizes from No.

4 to No. 4/0 without any additional cost.

We build rheostats for special requirements. Communicate with us Direct. There is no obligation. Sold by all Branches of NATIONAL THEATRE SUPPLY CO., SAM KAPLAN, NEW YORK, CONTINENTAL THEATRE ACCESSORIES, and by your dealer.

## HOFFMANN-SOONS

Electrical and Engineering Corporation  
387 First Ave., Mfg. Division, New York  
Contracting Electrical Engineers—Moving Picture  
Theatre Electrical Specialists

# RHEOSTATS

## Your Preference, Please!

**T**HE editors of **MOTION PICTURE PROJECTIONIST** solicit your aid to the end that this publication may be of the maximum service to you. Every subscriber can do his bit to improve this service by using the space provided below to indicate his preference for special articles and other material in which he may be particularly interested.

Let us know your preference, please. All requests will receive attention in the order of their receipt, so act quickly. Use the blank below to tell us in just what subject you are particularly interested. Do it now!

Editor,

M. P. PROJECTIONIST:

I am interested in the following subjects, on which I should like to see information in **MOTION PICTURE PROJECTIONIST**:

1. ....
2. ....
3. ....
4. ....

NAME .....

ADDRESS .....

(usually musical) separately from the picture which is to accompany it. See **POST-SCORING**, **PRE-SCORING**.

**SCRATCH**, **OPTICAL** or **SHADOW**. See **OPTICAL SCRATCH**.

**SCRATCH FILTER**. A choke coil and condenser used to filter out very high frequency sounds or ground noises—usually the needle scratch in wax reproduction.

**SCRATCH THE MIKE**. See **MIKE**, **SCRATCH THE**.

**SCREEN GRID TUBE**. A modified type of vacuum tube with high amplification. A fourth electrode—the screen grid—is used to reduce the electrostatic effect between grid and plate.

**SCREW, DRUNKEN**. Irregular tongue or groove, on the cam of the intermittent camera movement, which forces the claws in and out of the perforations in the film, to draw the film past the gate.

**SENSATION LEVEL**. Refers to loudness of sound, in decibels, compared to the intensity of sound of the same pitch, which would be just barely audible in quiet surroundings.

**SENSATION UNIT**. Same as **DECIBEL**.

**SENSIBILITY**. Ability to detect small differences in energy.

**SENSITIVITY**. Ability to detect small amounts of energy.

**SENSITOMETRY**. Measurement of response of light-sensitive substances (photographic emulsions, the eye, etc.) to radiation.

**SHADOW SCRATCH**. Same as **OPTICAL SCRATCH**.

**SHOULDER**. Over-exposure region of the characteristic curve of a photographic emulsion.

**SHREDDED WHEAT**. Film which has been badly cut due to having buckled and run off the sprockets.

**SHUTTER**. Generally means **SHUTTER**, **FLICKER**.

**SHUTTER, AUTOMATIC**. In a projector, a fire prevention device which falls into place between light source and film whenever the motor stops.

**SHUTTER, FLICKER**. Moving (usually rotating) device, which intercepts the beam of light in a motion picture camera, printer, or projector, once during each picture cycle. A different device from **SHUTTER, AUTOMATIC**.

**SILK**, (noun). (1) Piece of soft silk placed over a light to soften it. (2) **WIND-GAG**.

**SILK**, (verb). To put the silk in place.

**SIMPLE LENS**. See **LENS, SIMPLE**.

**SINE WAVE**. Simplest natural shape of wave, as pictured on page —.

**SING**. Undesirable high-frequency oscillations in the recording circuit.

**SINK**. Synchronization.

**SLICE THE MIKE**. To place the microphone at an angle to the source of sound (instead of directly facing it).

**SLOW**. Cf. **SPEED**.

**SOAK**. To soak batteries is to charge them heavily.

**SOFT**. (1) Of a vacuum tube, containing a little residual gas. (2) Of a focus, see **FOCUS, SOFT**.

**SOUND GATE**. Gate, similar to that used in picture projectors, through which the sound track is pulled past the reproducing light beam in gate-type machines.

**SOUND HEAD**. Compartment on the projector which contains sound-reproducing systems and mechanism for guiding and driving film.

**SOUND OVERSHOOTING**. In variable area recording, this refers to the condition where the peaks in the sound track extend beyond the limits of the track and are therefore cut off during reproduction. In variable density recording, this refers to excessively dense areas on the track. In either case, the quality of reproduced sound is affected.

**SOUND PICK-UP**. Device or system for reproducing sound. In disc reproduction, an electromagnetic device which transforms the waves in the grooves of the disc into variations of electric current. In film reproduction, an optical-electrical system contained in the sound head.

**SOUND TRACK**. A narrow band, along a film, (on the left side of the pictures), which carries the sound record.

**SOUNDING BOARD**. Board whose forced vibrations increase the intensity of sound from



any vibrating body attached to the board.

SOUP. Slang for DEVELOPER.

SPARK GAP. Short break in an electric circuit, forming an air condenser. If the voltage across it becomes sufficiently high, a spark discharge will take place across it.

SPEAKER. Contraction for LOUD-SPEAKER.

SPECIFIC GRAVITY of a substance is the ratio of the weight of a given volume of that substance to the weight of an equal volume of water.

SPECTROGRAM. Photographic representation of energy distribution along a spectrum.

SPECTOPHOTOMETRY. Science of measuring the distribution of energy along the spectrum.

SPECTROSCOPE. Instrument for analyzing light into its component colors.

SPECTRUM. Any arrangement of waves in the order of their frequencies. For light waves, the order of the spectrum, beginning with the highest frequencies, is: ultra-violet, violet, indigo, blue, green, yellow, orange, red, infra-red. If these were taken in the order of wave-lengths, beginning with the highest, the order would be reversed from that just given.

SPECULAR DENSITY. The value of density obtained when transmission is measured for highly collimated (and therefore mostly parallel) light—as in optical printing or in projection.

SPEED. (1) Of an emulsion: measure of the emulsion's sensibility to light. (See SENSIBILITY). Inversely proportional to INERTIA. (2) Of a lens: measure of the amount of light the lens can collect. Proportional to the square of the EFFECTIVE APERTURE.

SPIDER. Portable electric switch and contact.

SPIRAL REEL. See REEL, SPIRAL.

SPLICE. To join the ends of film by cementing.

SPLICE BUMP. Same as BLOOP.

SPOOR-BERGGREN. In this WIDE FILM system the film width is 63.5 mm.

SPOT. (1) Illuminated area on the cooling plate of a projector. (2) Contraction for SPOTLIGHT.

SPOTLIGHT. Lighting unit which projects a concentrated spot of light.

SPROCK. Slang for SPROCKET HUM.

SPROCKET. Toothed cylinder engaging the perforations in the film.

SPROCKET HUM or SPROCKET NOISE. 96-cycle note produced when the film runs through the pickup mechanism out of line so that the exciting light beam for the sound track passes through one edge of the sprocket holes.

STAMPER. Impression of MOTHER, obtained by electroplating. Used in a hydraulic press to stamp out the final playing records.

STANDARD FILM has a width of 35 mm.

STARTING BOX. Rheostat used to control current supplied to a motor during starting, to prevent damage to the motor winding.

STATIONARY PERIOD. That portion of the picture cycle during which the film at the aperture is stationary, expressed in degrees of revolution of the controlling flywheel ( $360^\circ = 1$  cycle).

STEP PRINTER. Machine which prints a positive, a frame at a time.

STEP-DOWN and STEP-UP TRANSFORMERS: See TRANSFORMER.

STEREOSCOPIC. Giving the illusion of looking into depth, as the two eyes perceive in actuality.

STEW. Undesired sounds (usually produced by defective equipment) particularly those heard in reproduction.

STILL. Ordinary photograph, as distinguished from a motion picture.

STILL MAN. The photographer who makes the stills.

STINEMANN (Stinemann). System (named after inventor) of developing motion picture film in portable laboratory apparatus.

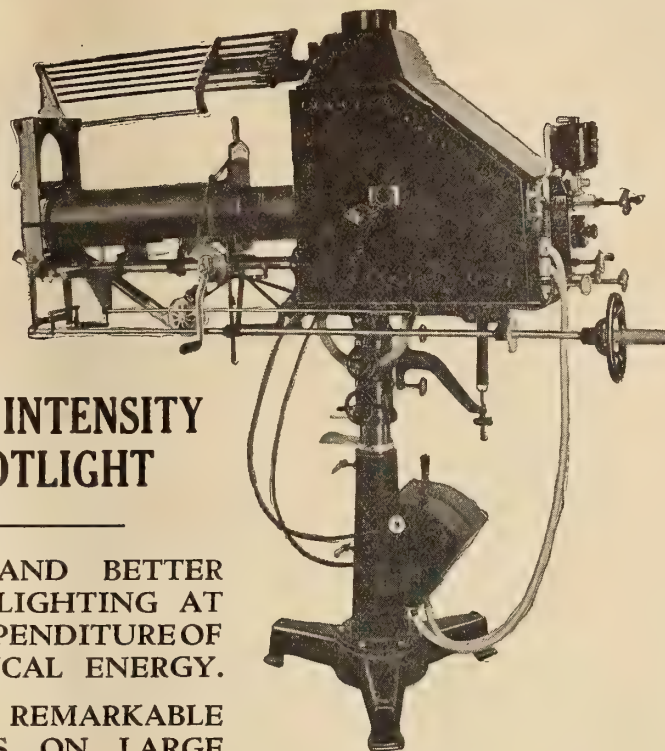
STOCK. Unexposed photographic film.

STOP. Lens diaphragm opening.

STOPPING CONDENSER. See CONDENSER. STOPPING.

STORAGE BATTERY. A battery which can be re-charged (i.e., have its electromotive force restored) by running a current through it in the direction opposite to its electromotive force.

STRAIGHT-LINE PORTION. Refers to that of an H and D CURVE.



## HIGH INTENSITY SPOTLIGHT

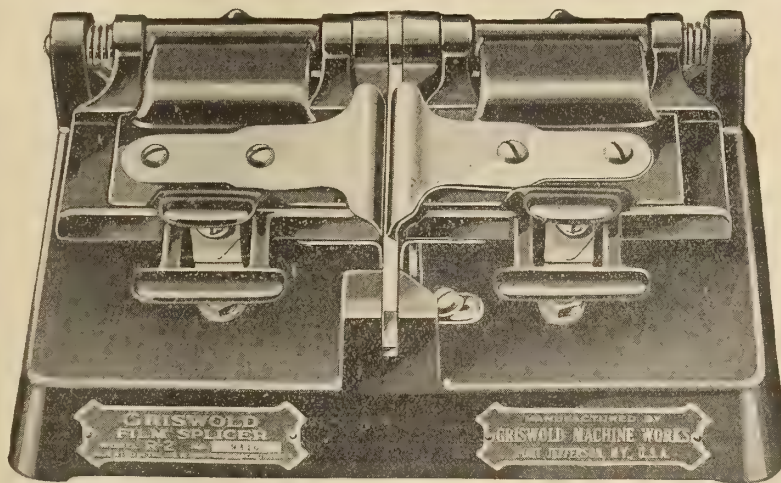
MORE AND BETTER  
STAGE LIGHTING AT  
LESSEXPENDITURE OF  
ELECTRICAL ENERGY.

MOST REMARKABLE  
RESULTS ON LARGE  
STAGE SETS.

### HALL & CONNOLLY, INC.

24 Van Dam St.

New York, N. Y.



*Known  
and used the  
World Around*

MORE than 15,000 Griswold Film Splicers are in constant daily use throughout the world. For years the perfect splice has been made with a Griswold. Griswold is the standard film splicer for efficiency, durability and economy.

### GRISWOLD MACHINE WORKS

Port Jefferson, L. I.

New York



# By Test Proven Best!



\$9.00  
Each

Imagine! Now on their second year of giving satisfactory service to Hi-Lo lamp users everywhere from Coast to Coast. Surely there must be a reason for this preference for the

## GEM CONTACT JAW

Designed right, made right, and priced right.

*Order a Spare Now!*

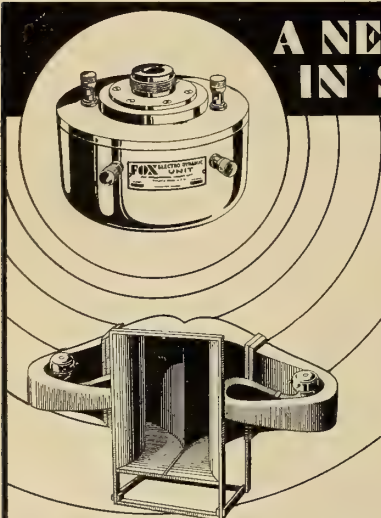
**FOGELBERG ENGINEERING CO.**

128 S. Clinton St.

Chicago, Ill.

*Sold by Reliable Independent Dealers Everywhere*

## A NEW DEPENDABILITY IN SOUND EQUIPMENT



Fox Units not only command attention for their output volume and tone value—they offer definite, exclusive coil and diaphragm features that insure continuous and trouble free service.

The Fox Electro-Dynamic Unit and the Fox Rams Horn is a combination that outdemonstrates anything on the market.

*Improve your present equipment with a Fox Unit.*

Complete sound engineering service. Estimates free for special work.

# FOX

**ENGINEERING COMPANY**  
386-392 Dorr St., Toledo, Ohio, U.S.A.

**STRETCH.** To introduce additional frames, during printing, in order to slow up the reproduction of the motions pictured.

**STRING.** (1) Ribbon of a light-valve. (2) Suspension of a Photophone galvanometer.

**STRING GALVANOMETER.** See GALVANOMETER, STRING.

**STYLUS.** Sharp cutting point.

**SU** See DECIBEL.

**SUBSTANDARD FILM** has width less than the standard 35 mm.

**SUBTRACTIVE PROCESS.** Color process in which various hues are obtained by the absorption, in varying degree, of one or more of the spectral colors comprising white light. In cinematography such a process utilizes colored prints. Compare ADDITIVE PROCESS.

**SUN ARC.** Type of SUN LAMP. An arc using high intensity elements. Generally made in mirror diameters of 24, 36 and 60 inches and consuming a current of about 150 amperes.

**SUN LAMPS.** A large lamp (SUN ARC or SUN SPOT) reflecting its light by means of a parabolic mirror.

**SUN SPOT.** Incandescent type of SUN LAMP. Power sizes are 2,000, 5,000, and 10,000 watts; generally made in mirror diameters of 18, 24 and 36 inches.

**SYNCHRONIZE.** To make synchronous; in particular, to add new sound effects or dialogue in synchronism with a picture which has previously been photographed with sound.

**SYNCHRONOUS.** Simultaneous; corresponding in time. In particular refers to accompaniment of a picture of action by the proper sound corresponding to the action.

**SYNCHRONOUS MOTOR.** Type of motor whose speed is governed by the standard of frequency of the alternating current supplied to it.

**SYSTEM, "F."** See "F" SYSTEM.

**SYSTEM, "U."** See "U" SYSTEM.

**SYSTEM, UNIFORM.** See UNIFORM SYSTEM.

## T

**TACHOMETER.** Instrument for measuring speed of rotation, as of a motor.

**TACK.** Slang for TACHOMETER.

**TAKE (verb).** To photograph or record a scene.

**TAKE (noun).** (1) Process of recording part of a motion picture, without pause. Refers to the period from the moment when the camera and sound recorder start operating to the moment when they stop. (2) The corresponding portion of film, or of sound record.

**TAKE-UP.** Mechanism by means of which a film is wound upon a reel after passing the aperture (in photography, printing, or projection); also, to wind it thus.

**TAKE-UP REEL.** Reel on which film is taken-up.

**TANK.** (1) Portable CAMERA BOOTH. (2) Large container in which films are developed.

**TANK SYSTEM.** Development in a TANK (2) for a time calculated according to the temperature.

**TEASER.** Same as TORMENTOR.

**TECHNICOLOR (Technicolor).** A subtractive color process in which an optical system throws two or more separate images on two or more successive frames of the same film, these being photographed simultaneously through different color filters (as red and green). The alternating frames are printed separately; the prints are dyed, and then are treated in such a manner that correctly colored images are transferred by IMBIBITION to another (single) positive print.

**TELEPHOTO LENS.** Long-focus lens which gives the effect of a close-up although the camera is at a distance. Cf. TELESCOPIC LENS.

**TEST.** Operation of determining quality or quantity. Specifically: (1) A try-out with a camera and/or sound to determine a player's fitness or suitability for a part; or (2) a piece of film made to test the condition of exposure and/or development, or else to determine how a given scene will photograph.

**THERMIONIC VACUUM TUBE.** See VACUUM TUBE, THERMIONIC.

**THIN.** Having a thin or transparent silver image—said of a negative or positive.

**THREADING-UP.** Operation of starting the film through the camera, printer, or projector, as the case may be.

## SOUND REELS

For Perfect Projection

**ALL-WELDED TYPE**  
One Unit

**LASTING DURABILITY**

Bright Cadmium Plated

**UNIVERSAL ELECTRIC**  
9-16 Thirty-seventh Ave.,



—All Sizes—  
**DEMOUNTABLE TYPE**  
Each side one unit

**ALL PARTS  
REPLACEABLE**

Write for quotations

**WELDING COMPANY**  
Long Island City, N. Y.



**THREE-WIRE SYSTEM** of distributing electricity. For alternating current, such a system will be two or three-phase. For direct current, the voltage between one wire and the second ("middle") is approximately equal to that between the third and middle wires; and the middle wire is generally connected to ground.

**THROW.** Same as **PROJECTION DISTANCE**.

**TILT.** To rotate a motion picture camera parallel to the direction of film motion and in a vertical plane through the optical axis.

**TIMBRE.** Same as **QUALITY**.

**TIME OF REVERBERATION.** See **REVERBERATION**.

**TINTING.** Coloring of film in whole or in part, formerly usually accomplished by dyeing the gelatine side. Now usually done by printing on the film with a colored base.

**TOE.** Underexposed region of the characteristic curve of a photographic emulsion.

**TONE.** Musical sound of definite frequency.

**TONING.** Coloring a film by chemical action on the silver image.

**TOP.** High-frequency sounds.

**TORMENTORS.** On sound stages: Large movable panels covered with various materials for controlling acoustics, and so placed in a set that they will not be photographed.

**TRACK, SHOW THE.** To remove the sound track mask, in projection, so as to permit an image of the track to appear on the screen beside the pictures.

**TRACK, SOUND.** See **SOUND TRACK**.

**TRAILER.** Piece of blank film attached to the end of a picture series.

**TRANSFORMER.** Apparatus used in an a-c circuit to raise (STEP-UP) or lower (STEP-DOWN) the voltage. Consists (in its simplest form) of two coils of wire and a laminated iron core, all insulated from one another. Current in the primary coil sets up magnetic flux around the core; the variations in this flux, due to the variations in the primary current, set up a similarly alternating current in the secondary coil. In general, the voltage across each coil is proportional to the number of turns on the coil; the current in each coil is inversely proportional to the voltage.

**TRANSMISSION.** Ratio of intensity of light or sound transmitted by a substance, to the amount of intensity originally falling on it.

**TRANSMISSION UNIT.** See **DECIBEL**.

**TRANSMITTER.** Same as **MICROPHONE**.

**TRI-COLOR RATIO.** Ratio between intensities of an emulsion for violet and blue, green and yellow, and red.

**TRIODE.** Three-element electrode vacuum tube.

**TU.** See **DECIBEL**.

**TUBBY** reproduced sound predominates in low frequencies, and sounds as though it originated inside of a tub or barrel.

**TUBE RING.** Undesirable ringing noise in the recording system, due to vibration of an amplifier tube.

**TUNING.** Process of adjusting frequency of vibration to secure maximum response, as in a radio.

**TURN 'EM OVER.** Order to get cameras and recorder into synchronous action.

**TURNTABLE.** Rotating device on which disc records are mounted.

**TWINS.** Double arc lamp used in lighting set.

**TWO BELLS.** At certain studios, signal that preceding take may be broken, and silence is no longer necessary.

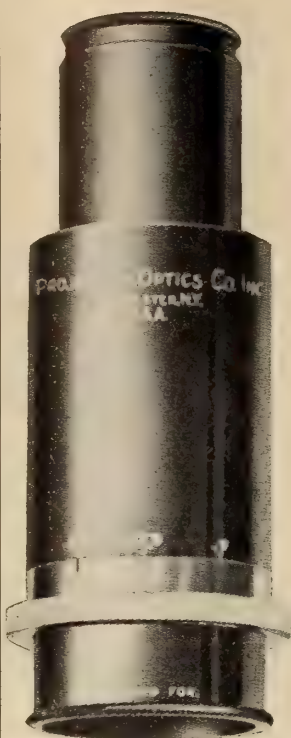
**U**

**"U" SYSTEM.** See **UNIFORM SYSTEM**.

**ULTRA-VIOLET** light rays are invisible rays beyond the violet end of the spectrum. They act strongly on photographic emulsions in the same way as visible light does.

**UNDER-MODULATED.** Of a sound record: not utilizing enough of the possible recording range of volume.

**UNIFORM SYSTEM.** System of marking lens diaphragm stops in numbers corresponding (though not directly) to their relative speeds. An increase of 1 in the U.S. number corresponds to a 50% decrease of speed, i.e., a doubling of exposure to give the same photographic result. An aperture of F:4 (see "F")



## SUPER-LITE LENSES

WISELY CHOSEN BY  
AMERICA'S BEST THEATRES

### New Bifocal Super-Lite Lens

An adjustable focus lens with a wide range of foci for both silent and sound film.

### Series III. Super-Lite Lens

Standard full Half-Size lens furnished in short focus as low as 4" E. F. and up to 10" E. F.

### Series IV. Super-Lite Lens

Full 3" diameter lens to meet the demand for more light for longer throws. 6" E. F. to 10" E. F.

*Quality Guaranteed*

**PROJECTION OPTICS CO., INC.**

330 Lyell Avenue

ROCHESTER, N. Y.

U. S. A.

## Universal Film Splicing Machine

MODEL NO. 3

Pat. March 22:22

First-Class Results on New or Old Film  
Permanent Gauge

No Adjusting

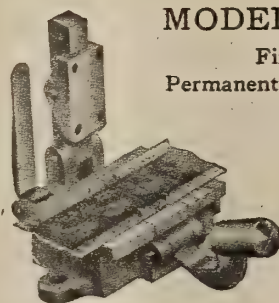
FOR THEATRES, EXCHANGES  
LABORATORIES, SCHOOLS

**Price \$6.00**

**GENERAL MACHINE CO., INC.**

816-826 East 140th St., NEW YORK, N. Y.

*For sale by all Supply Dealers*



**Give This to Your Friend—Have Him Fill It in and Mail to us at Once**

The Motion Picture Projectionist  
45 West 45th Street, New York City

Gentlemen:

Enclosed please find \$2.00 for which enter my subscription for one  
year (12 issues) starting with.....issue. (Two years, \$3.00.)

Name .....

Street ..... State .....

City..... Local No. ....



SYSTEM) corresponds to 1 in the U.S. system.

**UNMODULATED TRACK.** That part of a variable density sound track on which no density variations due to sound modulations have been impressed.

## V

**VACUUM.** A space from which nearly all matter has been removed.

**VACUUM TUBE, THERMIONIC.** Evacuated tube containing a wire filament, a metal plate, and often other electrodes. An electric current is passed into the tube and through the wire filament; the filament becomes hot and electrons are boiled out of it. A positive voltage being applied to the plate, the electrons flow across the vacuum onto the plate, and thus set up an electric current in the outside circuit connected to the plate. In tubes for most purposes there is a third element known as a GRID.

**VALVE.** Device to regulate flow (as of water, or of a beam of light).

**VALVE LIGHT.** See LIGHT VALVE.

**VALVE, MAGAZINE.** See MAGAZINE VALVE.

**VALVE AMPLIFIER.** Three-electrode vacuum tube amplifier.

**VALVE RUSTLE.** Rustling noise heard in reproduction, due to clashing of the light-valve ribbons in the course of recording.

**VARIABLE AREA RECORDING.** Method of sound recording in which the sound track is dark on one side and transparent on the other, the irregular boundary line between dark and light sides representing the loudness and frequency of the recorded sound.

**VARIABLE CONDENSER.** See CONDENSER, VARIABLE.

**VARIABLE DENSITY RECORDING.** Method of sound recording in which the sound is recorded as a number of parallel lines perpendicular to the edge of the sound track and extending across its full width. The distance between lines is determined by the frequency of the recorded sound; the density of the lines is determined by the loudness.

**VELOCITY CONSTANT.** Measure of speed with which an emulsion develops.

**V. I.** Abbreviation for VOLUME INDICATOR.

**VIBRATOR.** A vibrating body. In particular, a device used in the RCA Photophone system of sound recording.

**VIEW, ANGLE OF.** Angle, under which the diameter of the circular area covered sharply by a lens appears from the center of the lens.

**VIEWING ROOM.** One of the several small theatres on the lot principally used for the showing of DAILIES.

**VIOLET RAYS.** Sometimes used, incorrectly, for ULTRA-VIOLET RAYS.

**VIRTUAL IMAGE.** See IMAGE, VIRTUAL.

**VITAPHONE.** (Vitaphone). The Warner Brothers system of disc recording and reproduction of sound.

**VOLUME.** Same as loudness of sound.

**VOLUME INDICATOR.** Device for measuring the loudness of sound. Abbreviated V.I.

## W

**WATT.** Unit of power (see POWER). Power employed to do ten million ergs of work in one second. Power produced by a one-ampere current falling through a potential difference of one volt. 746 watts equals one horse-power.

**WAVE, CONTINUOUS.** See CONTINUOUS WAVES.

**WAVE-FRONT.** Crest of an advancing wave.

**WAVE-LENGTH.** Distance between crests along a wave.

**WAX STEW.** Undesired sound heard on wax record.

**WEAK.** Of a film, same as THIN.

**WHERE IS THE . . . ?** Applied to a recording or variable instrument, means "What is the reading of the . . ."

**WHISKERS.** A type of pulsation of intensity in reproduced sound. See WOW-WOWS for explanation.

**WHISTLE BOX.** A movable device, usually only a choke coil, for electrically filtering out the hum in arcs and lamps for sound studios.

**WHITE LIGHT.** In certain studios, signal that re-recording operator is ready.

**WIDE FILM** has a width greater than the standard 35 mm.

**WIDE-ANGLE LENS.** See LENS, WIDE-ANGLE.

**WILD WALL.** A movable wall, covered with sound-absorbing material, and suitable to be photographed.

**WIND-GAG.** Silk cloth placed over a microphone to prevent disturbance by wind pressure.

**WIRE GAUGE.** Diameter of a wire, in one of various systems arranged for convenient designation.

**WOW-WOWS.** A type of pulsation of intensity in reproduced sound, due fundamentally to change of speed of the sound track during either recording or reproduction. While this change of speed produces a change of pitch, the latter, when the fluctuation is rapid is generally not perceptible but the phenomena of interference of sound waves in the theatre cause this change of pitch to produce a rapid periodic change of intensity. Wow-wows correspond to a variation in speed of, say, up to six cycles per second; FLUTTER, to a variation of about six to thirty cycles; GARGLE, 30 to 200 cycles; and WHISKERS, over 200 cycles.

## X

**X-BACK.** Negative film coated on the back with gelatine, to eliminate frictional electricity, which causes marks on the film.

## Abstracts of Recent Patents

U. S. 1,792,171. K. Kruening. Assigned to Kollmorgen Optical Corp. A method of mounting lens elements whereby they cannot be wrongly repositioned after removal for cleaning.

U. S. 1,791,893. P. Favour. Assigned to Eastman Kodak Co. A method of making a "fade-out" and "fade-in" of a spliced film which includes a perforated strip, the perforations graduating in both directions from the center, which may be applied to the film.

Br. 339,971. W. W. Triggs; Multicolor Films, Inc. Film material, particularly cinematograph film, is colored by running it along the surface of the coloring liquid in which the lower face of the film is pressed by guides adapted also to prevent the liquid from contacting with the upper face of the film.

Br. 340,022. C. Marshall. Relates to combined cinematograph and sound reproducing apparatus in which two indicators are provided, one moving in accordance with the picture film and the other in accordance with the movement of the stylus across the sound record, both indicators being graduated according to markings on the picture film.

U. S. 1,787,919. A. H. Watson. An apparatus for producing sound pictures which uses a record having visual impressions, sound impressions and synchronizing impressions. The apparatus is provided with a means for translating the visual impressions into a visible picture, a means for translating the sound impressions into sound and a means responsive to the synchronizing impressions for producing a predetermined relationship between the picture and the sound.

Fr. 682,861. C. R. Blum. A system synchronizing an orchestral accompaniment and motion pictures which includes a separate film, synchronized with the motion picture film, having music notes inscribed thereon which may be read by the orchestra leader.

Fr. 683,522. H. France. A motor van equipped with projection and sound reproducing units so that sound pictures may be reproduced in the open.

Fr. 683,426. G. Pittaluga di Silvio. A continuous projector having a double pair of oscillating prisms and a double pair of rotating semi-crown circular reflectors to effect optical compensation.

Ger. 506,230. F. Häusler. In a projector designed for stereoscopic projection in which the focal length of a projection lens is periodically altered by an intervening correction lens, an optical system is employed involving a rotating crown of correction lenses.

Br. 340,184. A. S. Harkness. In projection screens according to Br. 328,112, and comprising a lace curtain fabric wherein the ground is covered completely and uniformly with patterning effect, so as to present at one side as nearly as possible a solid picture projection surface, and at the other side a cellular surface adapted to collect sound waves from a

## Index of Advertisers

Amplion Products Corp. .... 37

Bausch & Lomb Optical Co. .... 5

Bell Equipment Corp. .... 33

Best Devices Co. .... 34

Bioscope, The .... 37

Brenkert Lt. Projec. Co. .... 6

Canadian Theatre Supply Co. .... 34

Chalmers Publishing Co. .... 37

Eastman Kodak Co. .... 34

Fish-Schurman Corp. .... 5

Fogelberg Engineering Co. .... 40

Forest Electric Corp. .... 36

Fox Engineering Co. .... 40

General Machine Co. .... 41

G-M Laboratories, Inc. .... 36

Griswold Machine Works .... 39

Hall & Connolly, Inc. .... 39

Hoffman & Soons, Inc. .... 38

Ilex Optical Co. .... Front Cover

International Projector Corp.,  
Back Cover

Kaplan, Sam, Mfg. & Supp. Co. .... 2

Movie Supply Co. .... 36

National Carbon Co. .... 7

National Theatre Supply Co. .... 43

Projection Optics Co. .... 41

RCA Photophone, Inc. .... 8

Rice, J. M., & Co. .... 37

Roth Bros. & Co. .... 4

Strong Electric Corp. .... 35

Universal Elec. Welding Co. .... 40

Weber Machine Corp. .... 3

Weston Elec. Inst. Corp. .... 6

sound reproducing apparatus, the screen is provided with small uniformly spaced apertures. The apertures may be in rows, those in adjacent rows being relatively staggered, may be formed by dropping one or more stitches, and may be cleared by an air blast if the screen is sprayed with a fire and waterproof substance.

Fr. 683,262. E. Basso. A projection screen having a color mosaic thereon to give the effect of color to projected pictures.

U. S. 1,793,198. J. R. Towne. A film reel having a portion of one flange bent inward over the core to clamp the end of the film.

Fr. 683,155. Allgem. Elektrizitäts-Ges. A motion picture film reel having flanges disposed so that they may turn with respect to the core to which the film is attached.

U. S. 1,791,254. R. Von Brockdorff. Assigned to Schutte and Koerting Co. Moisture is prevented from forming on the elements of an optical system by the introduction of heat by means of a resistance to the support of said elements.

U. S. 1,792,690. K. C. Hamer; C. W. Rodgers. A device to prevent binding of film on bent reel flanges upon being unwound, comprising a roller, bearing upon the film, supported by two rollers contacting with the reel flanges.

U. S. 1,794,043. J. E. Thornton. Assigned to J. O. O'Brien. A method of producing motion picture films having picture color components in pairs in direct succeeding order, upon a double width film or two single width films, from a single width negative upon which the pairs are formed, each with their two components arranged in alternating order.



# *A* *FRIENDLY SERVICE* *always near at hand*

**I**T IS always rather assuring to know that when trouble comes, there is a nearby source of relief. Only a few hours from any theatre in the United States, there is a National Projection Service Station with plenty of relief equipment on hand to help you out in an emergency. There is also a friendly National Sales and Service Representative—who is familiar with your routine problems—always ready to do you a good turn when you need him. And back of all this is a nationwide organization to assure your complete satisfaction on every purchase. Day or night, National is always ready with friendly service.

## *New Low Prices on Staple Supplies*

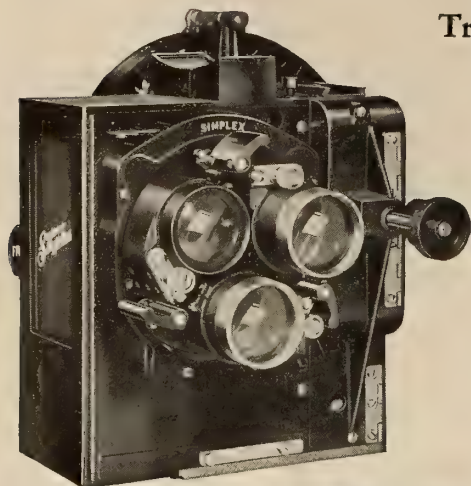
*Effective July 1, 1931*

	Old Prices	New Prices
National Film Cement, per bottle . . . . .	\$ .20	\$ .15
Typewriter Slide Mats, per box . . . . .	1.50	1.35
Thumb Tacks, per 100, 1/2" . . . . .	.20	.15
5/8" . . . . .	.25	.20
National Sound Reels, 15-inch, each . . . . .	2.85	2.50
Leland Film Cleaners, each . . . . .	7.50	5.00
Slide Cover Glasses, per dozen . . . . .	.20	.15
Slide Binding Tape, per package . . . . .	.15	.10
David's Slide Ink, per bottle . . . . .	.25	.20
Brass Stock Signs, each . .	.50	.35

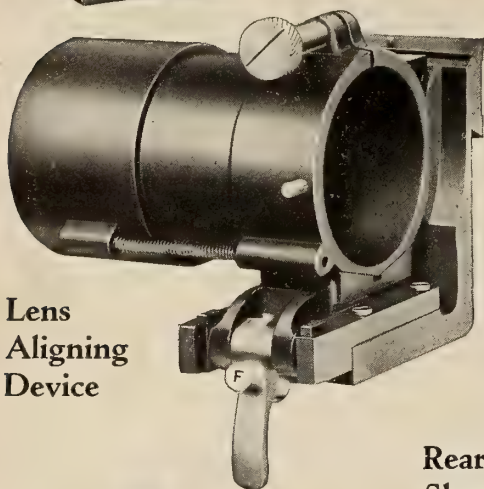
**NATIONAL THEATRE  
SUPPLY COMPANY**  
*Branches in all Principal Cities*



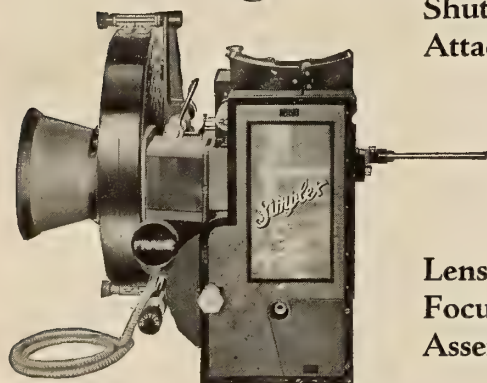
# *Simplex* TRADE MARK REG'D. ACCESSORIES



Triple Lens  
Turret

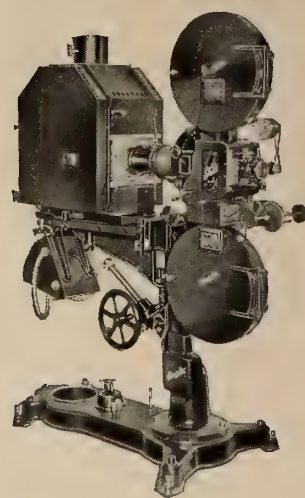


Lens  
Aligning  
Device



Rear  
Shutter  
Attachment

Lens  
Focusing  
Assembly



Various Models of

*Simplex*  
TRADE MARK REG'D.

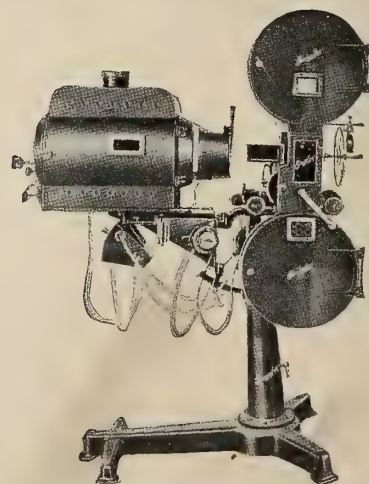
*The International Projector*

WILL ALWAYS BE MANUFACTURED TO  
MEET THE REQUIREMENTS OF OUR CUS-  
TOMERS THROUGHOUT THE WORLD.

THIS POLICY HAS ENABLED US TO

MAINTAIN *Simplex* SUPREMACY

FOR OVER TWENTY YEARS



INTERNATIONAL PROJECTOR CORPORATION  
92 GOLD STREET - - NEW YORK



# MOTION PICTURE PROJECTIONIST

*(Fourth Year of Publication)*

## THE ILEX F:2.5

STANDARD ADJUSTABLE  
PROJECTION LENS

### SHORT FOCAL LENGTHS

A new era in screen presentation brings forth larger pictures and wider screens. "Grandeur" effects from 35mm. film are now possible for every theatre with ILEX, offering the finest short focal length lenses that the present day market affords. This is true because ILEX lenses are corrected for critical definition, maximum sharpness, brilliant illumination and flatness of field. Slop-over and incomplete covering of the screen are cared for by the exclusive ILEX adjustable feature.

For the projection equipment you use, ILEX lenses are the best . . . perfect in performance . . . faithful in service. We can furnish engineering data and interesting literature to cover your projection problems.

ILEX OPTICAL CO. ROCHESTER, N. Y.



FURNISHED IN A WIDE RANGE  
OF FOCAL LENGTHS  
2½" to 9"



OPTICAL PRODUCTS OF PRECISION

# ILEX OPTICAL CO.

INSIST UPON ILEX — THE LENS THAT PUTS PERFECTION IN PROJECTION

A Mancall  
Publication

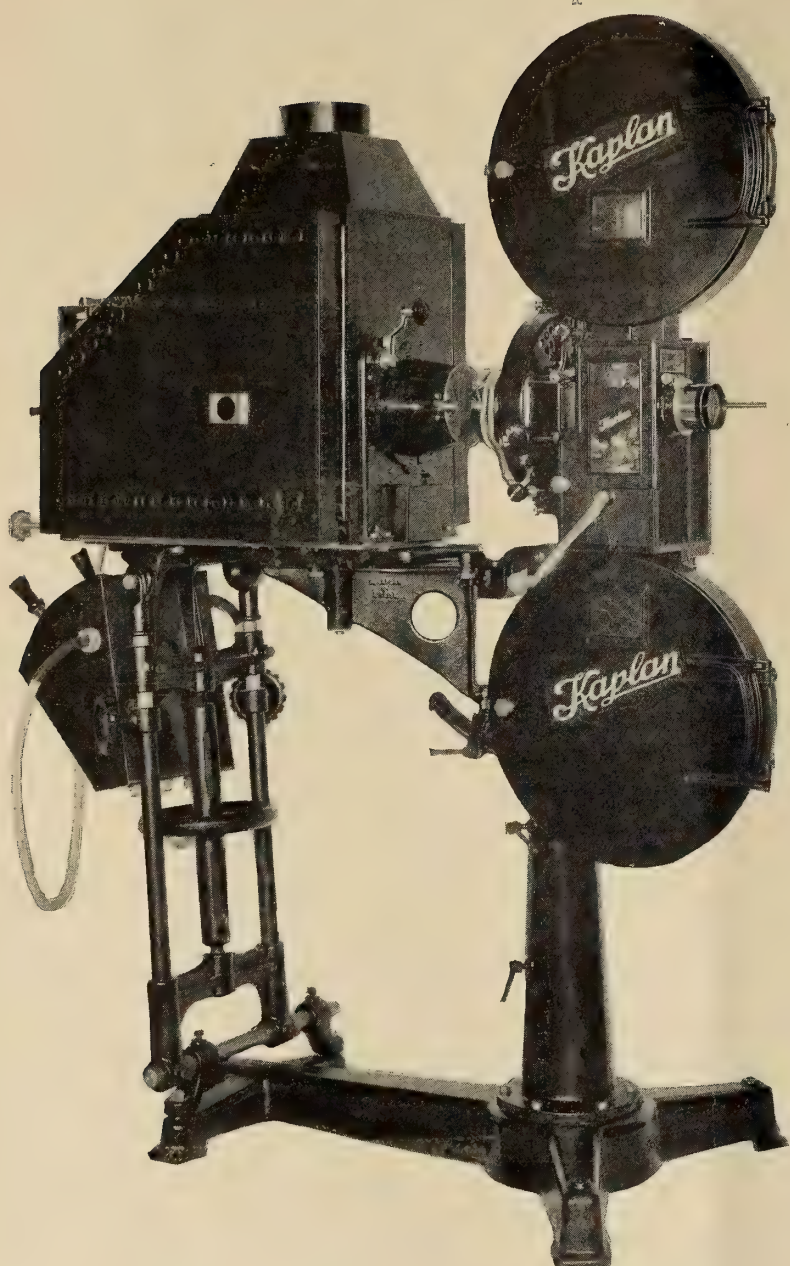
AUGUST, 1931

Vol. 4, No. 10  
25c. per copy  
\$2.00 per year



# KAPLAN

## PROJECTOR



The Kaplan projector has been standard equipment in many of the country's leading theatres for many years. Time has proven it to be a mechanism based on the soundest of engineering principles, both in design and construction.

Rigid — where rigidity is essential; no vibration; easy, smooth-running, noiseless, and long-enduring, it stands as a monument to the best and most modern factory methods and engineering work. Performance over a

long period of time is the acid test of all good product. Time and performance have been the best salesmen for the Kaplan Projector.

*An Engineering Product*

**SAM KAPLAN MANUFACTURING and SUPPLY COMPANY, Inc.**

729 Seventh Avenue

--

--

New York City



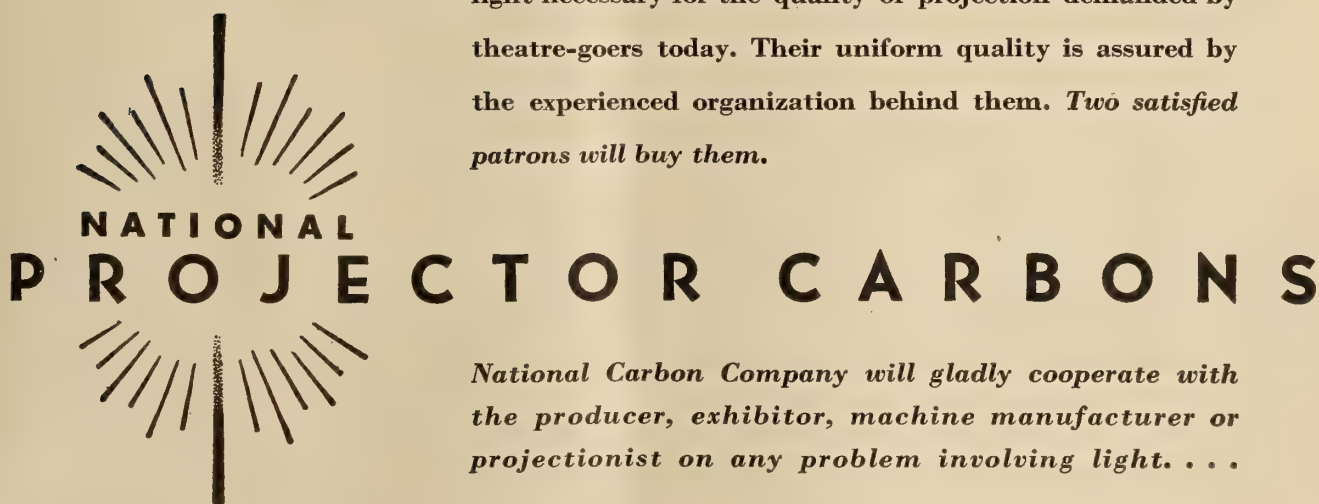
# Two Patrons

## ... Buy Your Carbons

**T**HE modern theatre and its furnishings represent the acme of splendor. The staff is thoroughly trained. Managers carefully select pictures in accord with popular taste. This lavish expenditure to attract patronage. Yet, if the screen is dim or the light unsteady, valuable patronage will be lost . . . . . and two empty seats cost more than your carbons.

Light is the most important factor in the operation of a motion picture theatre. That is why National Projector Carbons are preferred by the projectionist. They are dependable. And the manager knows that, with good projection, patrons will return and bring their friends.


National Projector Carbons give the steady, brilliant white light necessary for the quality of projection demanded by theatre-goers today. Their uniform quality is assured by the experienced organization behind them. *Two satisfied patrons will buy them.*



*National Carbon Company will gladly cooperate with the producer, exhibitor, machine manufacturer or projectionist on any problem involving light. . . .*

**NATIONAL CARBON COMPANY, INC.**

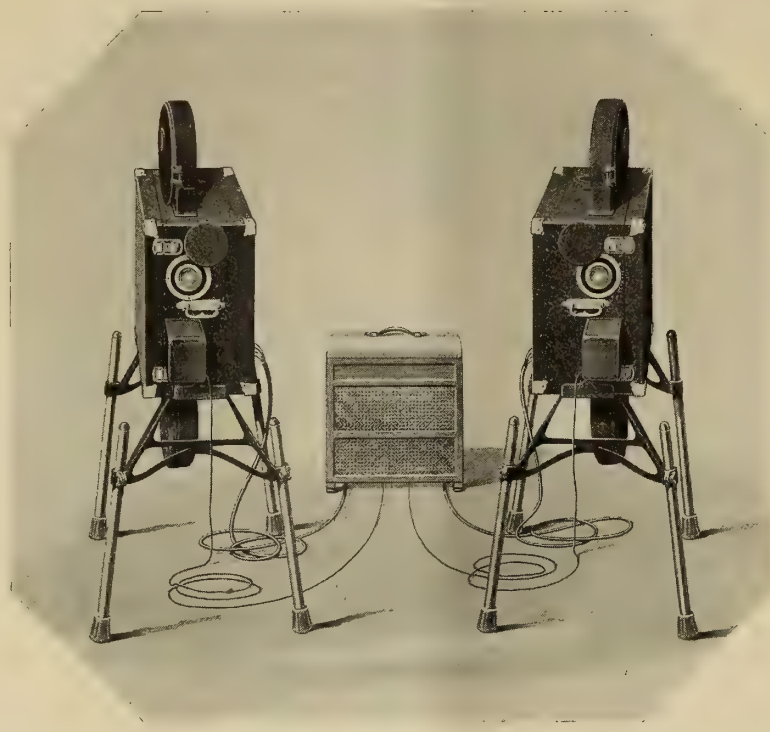
Carbon Sales Division      Cleveland, Ohio

Unit of Union Carbide  and Carbon Corporation

Branch Sales Offices:    New York    Pittsburgh    Chicago    San Francisco



# Bell 35m.m. Portable Sound Film Projector—



**The Complete Solution to the Sound Problem for Smaller Theatres—  
Highest Quality Performance with Economy, Adaptability and Profit Plus**

Primarily designed for portability, Bell equipment is in every respect truly professional in its optical system, sound reproduction and mechanism. It is the first equipment of its kind that has been designed to fulfill the requirements of picture projection and sound reproduction in a manner equal in every respect to the performance of the best of permanent theatre equipments.

For owners of smaller theatres seating up to 1,500, it offers the only logical solution to the sound problem, at a price within reasonable bounds. An owner equipped with Bell, is not irrevocably tied to his location. The change from semi-permanent installation to portable equipment wherewith to fulfill engagements outside the theatre is the work of a few minutes. This opens up a wide field for extra profit to theatre owners. The theatre owner who gets into the rental field through Bell equipment, can give the laugh to competition.

Bell equipment is engineered for sound, not adapted to it. The Tandem unit, illustrated above, is designed in right and left projectors. Can be set up with 18" between lenses or 20 ft. apart. The exclusive Bell Uni-remote control provides for smooth "change over," and individual operation of each projector from one central point.

The exclusive safety features incorporated with Bell design, of which the automatic "dowser" which shuts off all current when film has run through, or parted, the rear shutter construction, the forced draft cooling system and fire proof mounting, are outstanding, make Bell the safest of projectors yet designed.

Film operating parts are masterpieces of advanced projection engineering. Drive mechanism consists of a large induction motor which assures constant speed under the most adverse conditions.

Lubrication is rendered automatic by immersing moving parts in a bath of oil.

All steel parts are chromium plated.

Standard lamp equipment consists of 1000 Watt lamp, but 900 Watt may be had if desired, and for semi-permanent installation arc lighting may be employed.

The projection lens mounts will take any type of lens of standard dimensions. Standard size theatre screens can be fully covered at 50 to 100 foot throws.

Bell sound reproduction is truly superb.

Bell equipment can be used indoors or out. No special wiring necessary. Operates entirely from 110 Volt A.C. house current.

The Bell Tandem Unit complete consists of two projectors, with lenses and lamps, one amplifier and uni-remote control panel, in metal case, speaker unit consisting of two synchronized dynamic speakers, and baffle board in case, and one film magazine case.

Weight complete 215 lbs.

Price of Bell Tandem Unit, complete as above, \$2,150. Detailed descriptive folder will be mailed upon request.

*Inquiry is solicited regarding our Distributor Plan, from responsible parties in unoccupied territory.*

## BELL EQUIPMENT CORPORATION

729 SEVENTH AVENUE, NEW YORK CITY

FACTORY: DERBY, CONN.

*Visit us during the Radio World's Fair, New York, Sept. 21-26, Booth 8—Section F. F.*



# MOTION PICTURE PROJECTIONIST

August, 1931

Vol. 4, No. 10

JAMES J. FINN, Editor

Lester Isaac, *Efficiency*; J. H. Kurlander, *Light*; Thad Barrows, *Conservation*; J. E. Robin, *Equipment*; Samuel Wein, *Research*; R. H. McCullough, *Sound Projection*; Harry Rubin, *Improvement*; Victor Welman, *Personnel*; Sidney Burton, *Production*

Published monthly by Mancall Publishing Corp., 7 West 44th St., New York City. Subscription rates in U. S. and Canada: twenty-five cents per copy; two dollars per year; three dollars for two years. Add one dollar for foreign postage. Changes of address should be submitted three weeks in advance of publication date to insure receipt of current issue. Entered as second class matter Oct. 25, 1927, at Post Office, New York, N. Y., under the act of March 3, 1879. Additional entry at New Brunswick, New Jersey.

## Canadian Representative

H. N. Elliott, 203 Vaughan Road  
Toronto, Canada.

## Australian Representative

McGill's Agency  
179 and 218 Elizabeth St.  
Melbourne, Australia.

## Advertising Manager

Mortimer Glancoff

## Editorial & Advertising Office

7 West 44th St.  
New York City.



## 65 mm. Film Size Seen as the "Ideal" for Wide Film

Dr. N. M. La Porte, director of research for Paramount-Publix, recently had some interesting things to say relative to the advantages of using 65 mm. film. Dr. La Porte pointed out that 65 mm. film not only supplies an increased angle of vision but greatly increases the sharpness of the picture.

He also explained that the installation of wide screens in several of the Paramount-Publix houses had nothing to do with the advancement of wide film photography, although when wide film productions are released the screens could probably be used for that as well as their present use in relation to the Magnascope. In respect to recent experiments with 65 mm. film Dr. La Porte made the following interesting revelation:

### High Magnification Ratio

"In the use of 35 mm. film on an average 24-foot screen, the magnification of the picture is approximately 90,000 to 1."

## A PREDICTION

IN 1914 Eastman announced the first panchromatic motion picture negative film. It swept the country... In March, 1931, Eastman announced the first stable ultra-speed panchromatic—Eastman *Super-sensitive* Panchromatic Negative, *Type 2*... It is predicted that just as color-sensitive film has practically replaced color-blind material, so the new Eastman *Super-sensitive* will make slower emulsions virtually obsolete... Naturally the producers and camera men who are adopting this remarkable film *now* will reap the greatest advantage... Eastman Kodak Company, Rochester, New York. (J. E. Brulatour, Inc., Distributors, New York, Chicago, Hollywood.)

**EASTMAN SUPER-SENSITIVE**  
Panchromatic Negative, *Type 2*

## F. S. C. GENUINE OPTICAL CROWN GLASS PLATES

Enclose all Portholes for Sound Films and Shut Out the  
Disturbing Noise of the Projection Room.

No Distortion

No Loss of Light

**FISH-SCHURMAN CORPORATION**  
45 West 45th Street  
NEW YORK CITY



# DON'T



Short-Change Yourself!  
Get **ALL** the Light Your  
Money Can Purchase by  
Using A

# Brenkert

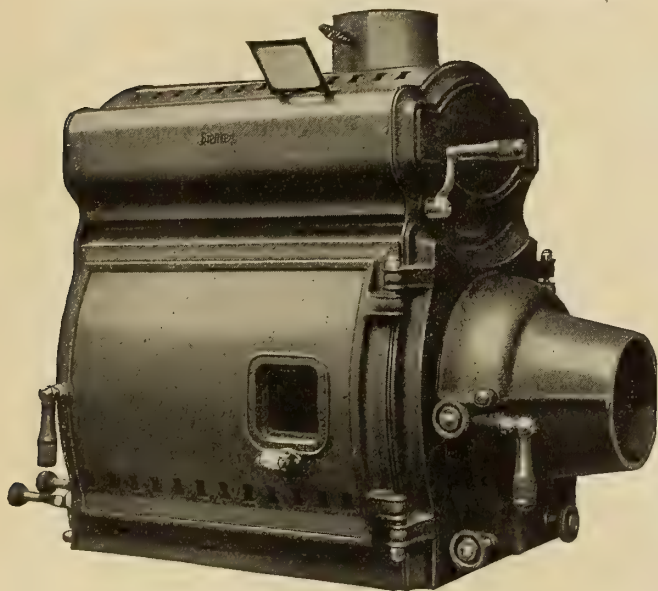
**SUPER HIGH INTENSITY  
PROJECTION LAMP**

*Consistently Delivers More Light at Lower  
Maintenance Cost*

**IN USE FROM COAST TO COAST**

Manufactured by one of the oldest manufacturers in the  
industry

*Distributed by Progressive Independent Supply Dealers*



Ask  
Any  
User



Write  
for  
Literature

**CORRECT DESIGN—PRECISION CONSTRUCTION**

**BRENKERT LIGHT PROJECTION CO.**

*Engineers & Manufacturers*

**ST. AUBIN AT EAST GRAND BLVD., DETROIT**

## W.E. Wins Decision in Pacent Case

**I**N an opinion of far-reaching importance given out recently, Judge Clarence G. Galston, of the Federal District Court in Brooklyn, N. Y., held that talking picture equipment of the Pacent type infringes upon patents embodied in the Western Electric System. The opinion affects a large number of theatres throughout the country now using Pacent equipment. It terminates favorably the first of a series of similar actions brought by the Western Electric Company on the same patents.

The action was begun in June, 1929, by the Western Electric Company and its subsidiary, Electrical Research Products, Inc., against the Broadway Theatre of Sol Walenstein in Buffalo in which Pacent equipment was used. The case was tried in that city before Judge Galston who was assigned for this case to the Western District Federal Court. It was defended by Warner Brothers who control a chain of theatres, some of which also use Pacent Equipment. Judge Galston stated that the "patents involved are of extreme importance, some of them, perhaps going to the very heart of the sound motion picture industry."

The opinion upheld the Western Electric Company on three patents finding them valid and infringed upon. One of these, the Colpitts patent, covers broadly the "push-pull" relation of vacuum tubes for the amplification of sound. The second, the Arnold patent, covers perfections in this arrangement. The third, the Mathes patent, embodies the most modern circuit for maintaining a uniform supply of power to the amplifier regardless of fluctuations at the source.

One of the contentions made by the defendant was that theatre owners who use films and sound records produced under Western Electric and ERPI licenses were by virtue of that fact licensed to use any type of reproducing equipment. Judge Galston denied this contention. The opinion found that the Lowenstein patent, covering the "grid bias," was invalid. It held that the Blattner patent, covering a device that permits the use of an alternating current supply to the amplifier, was not infringed upon.

Important as it is in itself, Judge Galston's opinion has a wider significance in its bearing on other suits, now pending, which involve the same patents. Such suits are awaiting trial in the Federal Court of the Southern District of New York against Pacent Reproducer Corporation and Pacent Electric Company, and in the District of Delaware against the Stanley Company of America.

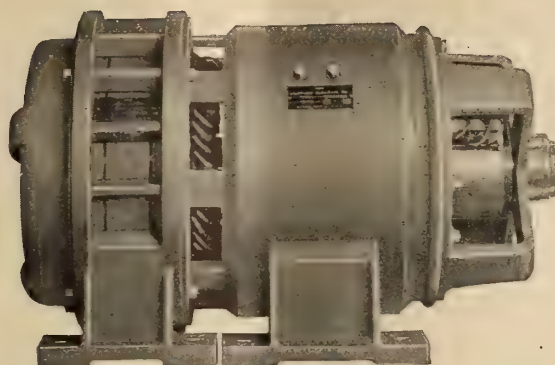
### "Not Seriously Affected," Says Pacent

A statement attributed to President Louis G. Pacent of the aforementioned case was issued from Pacent headquarters. It set forth, in part, the following:

"The Lowenstein patent, covering negative grid bias, has heretofore been considered basic with relation not only to amplification for sound picture reproduction but also for radio receiving set amplifiers, radio broadcasting, and in connection with telephone transmission. This patent has, in fact, been the structure upon which the claim of a practical monopoly of the field of sound reproduction has been based by ERPI as well as by RCA. It was upon this patent that the Pacent Reproducer Corp. concentrated because of the conviction that the other patents involved were not important in their nature and involved only modification and change of structure if actually valid and infringed. The so-called push-pull patent of Colpitts expires in February, 1932."

Mr. Pacent said that the decision would have no effect whatever on the Pacent Reproducer Corp. in its business of manufacturing and marketing sound reproducing equipments, other than to provide immediately an improved amplifier. With respect to the installations made, Mr. Pacent said that assuming that the patents held to be infringed were upheld in the Appellate Court, suitable arrangements would promptly be made with exhibitors which would result in re-conditioning Pacent apparatus and the installation of the improved amplifier in connection therewith.





*SKF Ball Bearing  
as used in Type MA  
TRANSVERTER*

## SMOOTHNESS IN OPERATION

One of the outstanding features of the  
**Type M A TRANSVERTER**  
is due to the fact that SKF Bearings—the  
highest priced bearings in the world are used.

### Side Lights on the Transverter

Roads are smooth  
or rough, depend-  
ing on the amount  
of air carried in  
your auto tires.

Projection is good  
or poor, depending  
on how accurately  
you control your  
current supply.

Let the Transverter  
make "Smooth Go-  
ing" for you.

Hertner Engineering Skill has done more than  
create accurate performance in building the  
Transverter . . . it has safeguarded it, by equip-  
ping the Transverter with the best in parts  
and materials which *other* Engineering Skill  
can produce.

SKF Bearings contribute materially to the  
smoothness of operation of all ball bearing  
Transverters.

Transverters are a lifetime  
investment in accurate  
voltage control.

*Manufactured Exclusively by*

# THE HERTNER ELECTRIC COMPANY

12688 ELMWOOD AVENUE

**TransVerteR**

CLEVELAND, OHIO, U. S. A.



It Can't Be  
EQUALLED

*The* **WHITE**  
**SAFETY CONTROL**  
WITH AUTOMATIC CHANGE-OVER

An Entirely New and Radically  
Different Safety Device that is  
Far in Advance of All Others.

Prevents Fires and Panics, Gives  
Absolute Protection to Film and  
Delicate Sound Mechanism.

Precision Made, Lightning Fast,  
No Unnecessary Stops. It is a  
Distinct Aid to Better Projec-  
tion.

---

IT IS SOLD OUTRIGHT

---

*For All Types of Professional Projectors*

*Made and Guaranteed by*

**WHITE ENGINEERING CORP.**  
PARAMOUNT BLDG. NEW YORK





# UNIFORM PROJECTION

*After all, that's what counts!*

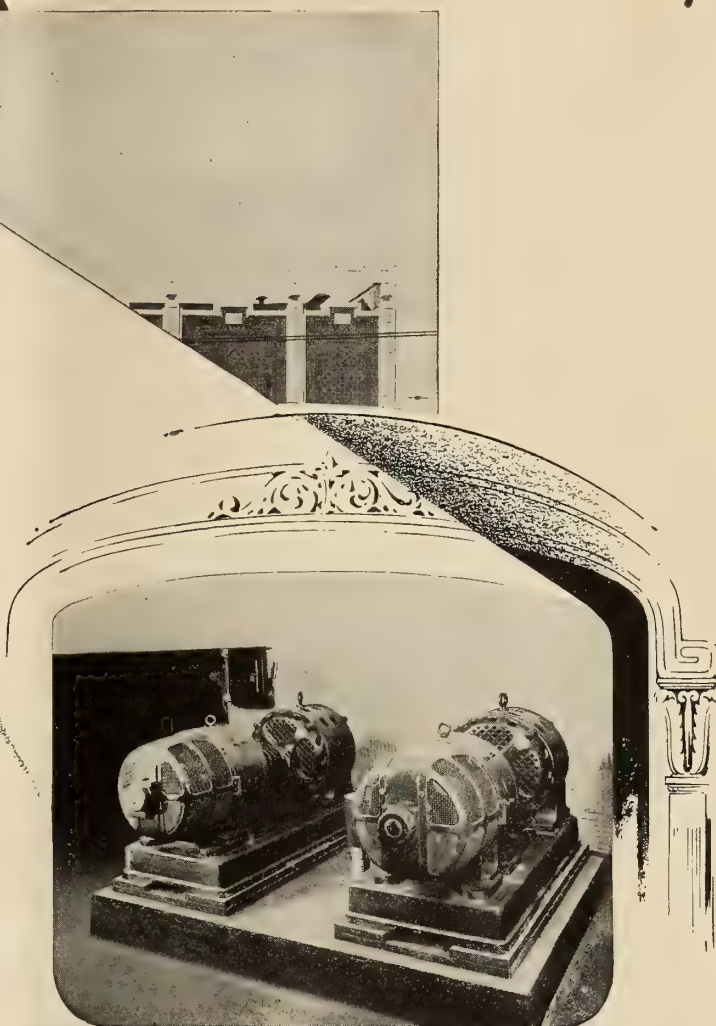


NORTOWN THEATRE, CHICAGO—  
A PUBLIX THEATER

BECAUSE of their ability to meet the particular power requirements of the projection booth, and to provide a steady direct current which produces an arc of uniform, unvarying intensity, ROTH Actodectors were selected by Publix for their new Nortown Theatre, Chicago.

Thirty-seven years of experience by Roth Engineers has resulted in perfectly balanced construction throughout the entire unit. Actodectors, resistors and control panels are so matched as to assure continuous, uniform projection even during change-over.

*Built in sizes from 20 to 600 amperes*



## *Some of the Many Advantages of ROTH Actodectors*

1. Accurately built and liberally proportioned.
2. Economical in operation. Actodectors operate at low voltage which reduces loss in ballast resistors.
3. Laminations are non-ageing and made of low-loss silicon steel for increasing efficiency.
4. Rolled steel frames—light weight—more efficient.
5. Any number of arcs can be carried within the ampere rating.
6. Especially satisfactory with sound projection equipment.
7. They supply steady direct current power of constant voltage—brilliant screen illumination of uniform intensity results.

**ROTH BROTHERS AND COMPANY**

*Division of Century Electric Company*

**1400 W. Adam St., Chicago, Ill.**

*Distributors and Offices in all Principal Cities*

DIRECT CURRENT MOTORS AND GENERATORS . . . MOTOR GENERATORS,  
ROTARY CONVERTERS AND EMERGENCY OR EXIT ELECTRIC LIGHT PLANTS



**The TECHNICOLOR work in  
"THE RUNAROUND" is the  
finest example of color photog-  
raphy I have ever seen . . .**

**The picture constituted a rigid test of TECHNI-  
COLOR'S new printing process. TECHNICOLOR  
successfully met every production challenge in  
the studio and has obtained beautiful results  
upon the screen.**

**The colors are brilliant and strikingly contrasted.  
In addition, TECHNICOLOR has achieved in "THE  
RUNAROUND" a perfection of registration and a  
sharpness of definition which represents a truly  
amazing advance over all previous color pictures.**



**(signed) WILLIAM LE BARON**  
**Producer, Radio Pictures**

**TECHNICOLOR**

**TECHNICOLOR MOTION PICTURE CORPORATION**

**BOSTON . . HOLLYWOOD . . NEW YORK**



# Are Stereoscopic "Movies" Possible?

By FRANK FOWELL

*Hugo Lateltin<sup>1</sup> has expressed the thought that the third dimension—that is, depth—is so illusory a quality as to be "purely a mental concept." This statement might have been considered ill-considered in some quarters, but until we read the accompanying paper by Frank Fowell, we were not appraised of any serious effort to disprove Lateltin's statement. Fowell in his paper flatly disputes the idea that the third dimension is a "mental concept," and he proceeds to tell why. It is interesting to note, however, that both writers are in agreement on one point, which is that stereoscopic motion pictures is a physiological rather than a mechanical problem, and it is quite possible that with a definition of terms and explanation of the methods by which their conclusions are reached, these gentlemen would find themselves practically in agreement on all phases of this engrossing question.—Editor.*

THE question whether stereoscopy will ever be accomplished in connection with cinematography depends largely on what one means by stereoscopy. In common with most people who have devoted a good deal of time and money to research in this field, my answer would be a reluctant "No." But qualifications are necessary. I have made and shown in Europe perfect stereoscopic films. In spite of that, I still say that stereoscopy appears to be the one hopeless and unsolvable problem of cinematography.

What is stereoscopy? First of all, it is a real thing; it is not an illusion or a "suggestion." There are hundreds of devices which are said to give an "illusion of depth" or a "suggestion of solidity." Screens, special lens systems and color filters have all in turn been described as "stereoscopic," but this use of the word is unjustified. Unless the process is carried out in such a way as to prevent the left eye seeing what the right eye sees, and *vice versa*, then the resultant picture cannot be stereoscopic. If those conditions are met and a single image results, then, and then only, can a process be called stereoscopic.

## Stereoscopic Stills 100 Years Old

Stereoscopic "still" pictures have been known for nearly 100 years for individual viewing, and many methods have been devised and patented for projecting and viewing still pictures in halls. This can be done in a variety of ways, which are susceptible of adaptation to the moving picture. Let me very briefly summarize them.

It is understood that in every instance two pictures have been taken by two similar lenses separated approximately the same distance as the human eyes, *i.e.*, about 2½ inches.

**Method 1.**—The left and right images are projected on a screen to show side by side. It is possible by training to exercise muscular action on each eye so that the left eye only sees the left image and the right eye the right image. This is a method which can only be adopted by individuals after considerable training and is obviously unsuited, therefore, for commercial purposes.

**Method 2.**—The two images are projected to show separately, and each observer is provided with a viewing device or analyser of one kind or another so arranged that only the left image is seen by the left eye and *vice versa*. The device may consist of prisms, mirrors or adjusted lenses, and in some cases it is necessary to have differing devices for observers seated in different parts of the house.

## Stereoscopic by Color

**Method 3.**—This is a method devised by Dr. Ives. The left and right images are apparently superposed on the screen, but are in reality enmeshed in a series of alternate lines and are filtered through a properly spaced grating which uncovers the lines of the left picture to the left eye. The difficulty with this method is that the eyes must be at a fixed distance from the grating, and the picture and any movement of the viewer causes trouble.

**Method 4.**—This involves the use of colored analysers. The left and right images are projected through red and green filters, or the film itself is dyed red and green in alternate frames. Each observer views the picture through lorgnettes or filters made of colored glass or colored gelatine, one lens being green and the other its complementary red. The two together in the average person balance out so that a reasonable accurate monochrome picture results, and a perfectly satisfactory effect of stereoscopy is produced. The difficulty here is that a large proportion of people are unevenly balanced as regards the color sensitivity of their two eyes and complain of seeing the pictures flat and tinted. Nevertheless, in view of the cheapness of this method, it is probably the most practical solution of the stereoscopic problem yet devised.

## The Use of Analyzers

I made and showed in London many years ago films made by this method,

and the results were extremely impressive. In fact, the late George Loane Tucker was so impressed that he arranged to make his second picture on his return to Hollywood on this system but, unfortunately, died before he could carry this resolution into effect.

The difficulty here is twofold. The process cannot be patented and, in the second place, we are persistently assured that the public will always object to viewing pictures through a device which must be held in the hand. I believe this prejudice to be unfounded because numerous stage shows have included items involving the use of colored spectacles, and the audience has never shown any objection to falling in with the needs of the situation.

## Revolving Shutters for Each Seat

**Method 5.**—This is much similar to the previous system, but the picture separation is obtained by means of polarized light, the two pictures being polarized in a plane rotated 90 degrees from each other. An analyzing device adjusted to match the polarizing planes and the projector bring about the desired separation of the left picture to the left eye and the right picture to the right eye. There are various difficulties in connection with the practical application of the system. Analysers are not cheap, they are not very light and there are screen troubles. It is a process better suited to the laboratory than to the theatre.

**Method 6.**—This method involves the old "persistence of vision" principle, but applied in rather a new way. In this system the right and left pictures are projected alternately on the same spot on the screen; but a mechanical device operated in one of a variety of ways cuts off the unwanted images from each eye. Each eye sees a picture in succession, and the combined effect is due to persistence of vision with a corresponding loss in image brilliancy.

It is a fairly simple matter to devise an apparatus which can be used in an ordinary auditorium giving synchronous interruption to the images. In early experiments I did this with a circular frame mounted on each seat, with magnets round the rim, operated from a central make-and-break device. This provided for continually revolving shutters operating synchronously throughout the entire house. But the drawback was that it was impossible for the viewer to change his position in his seat to any appreciable extent; moreover, the

<sup>1</sup>"Three-Dimensional Vision," by Hugo Lateltin, *Motion Picture Projectionist*, September, 1930, p. 9, Vol. 3, No. 11.



noise of the device in operation would nowadays be regarded as intolerable.

Before the war I patented a camera which employed a double-coated negative stock traveling vertically in a line parallel to the axes of the two lenses. Pictures were taken alternately on each side of this negative stock, and by subsequent double-printing a positive was obtained which could be run with ordinary color-separation spectacles. The results obtained were truly stereoscopic.

#### Condemn Audience Analysers

Only those who have actually seen stereoscopy on the screen can form any idea of the amazing vividness and actuality of the representation. It is literally as if the screen suddenly became a window into an outside solid world, and no effort could possibly be too great to secure this effect as part of cinematographic entertainment.

All these methods which involve the wearing of analyzers by the audience are condemned commercially because of the audience resistance to the use of this kind of apparatus, as well as of the difficulty of issuing and recollecting the necessary spectacles. Hundreds of attempts have, therefore, been made to secure the stereoscopic effect without the use of individual-patron appliances. Over a period of ten years I have, I should imagine, examined and reported on some hundreds of these, without ever meeting one which could be said to be even approximately successful.

#### Multiple Screens Fail

Projection on special screens consisting of transparent depths of from  $\frac{1}{2}$  in. to 18 in.; projection on to screens separated by 1 ft. or 18 in., the former being of transparent gauze, have been tried with minor variations unendingly, but all such processes are doomed to failure. They ignore the fundamental difficulties of the problem.

There are certain curious facts about human vision of which only the investigator into the stereoscopic problem is, as a rule, aware. Human vision is commonly regarded as an extremely accurate and satisfactory co-ordination of mechanism and brain. In point of fact the human arrangement of two eyes in the same horizontal plane is very unsatisfactory. Has it ever occurred to you that all stereoscopic vision is secured from vertical planes only? The fact is obvious if one considers the relation of the two eyes; but in practice it can be proved very easily.

#### We Really Need Four Eyes

If you take a round horizontal bar of indefinite length and view it at any distance in excess of 4 ft. or 5 ft. it is impossible to gauge its distance from the eye. A vertical pole reveals its distance instantly. The reason is that, in the case of the vertical pole, each eye can see slightly around the pole by reason of the horizontally

separated eyeballs, and the brain by co-ordinating the two images received can judge precisely the position of the pole.

In the case of the horizontal pole, both eyes are receiving precisely the same image, and unless they can see around the ends of the pole there is no possibility of gauging distance or securing an effect of solidity. If the head be bent into a position at right angles to the body the bar instantly jumps into a specific distance position.

## Opinions on Standard Release Print

The Standard Release Print continues to impel projectionists throughout the country to take their pens in hand and get off their ideas on the "ideal" change-over. Most interesting among the recent batch of opinions received are the following:

#### —Canton, Ohio—

Sir: The comments for and against the Standard Release Print appearing in your magazine are extremely interesting. As a sporting proposition, I consider the S. R. P. in the following light: I know of three "nags" that would put up an exciting race, thus:

1. Cue Meters, by a nose;
2. Click patches to place, and
3. Dots to show.

C. E. G.

#### —Sydney, Australia—

Sir: The S. R. P. is now in extensive use throughout Australia and New Zealand. I should like to set forth the views of myself and my fellow projectionists on this topic: We feel that as far as the first-run theatres are concerned, where projection is expected to be 100 per cent, the S. R. P. is a step backward. In our theatre (patronized weekly by experienced critics), we find that the prominent dots on the film are noticed, and I feel that this goes for the general public, too.

We are sorry that this system has been adopted, as it probably marks the passing for a long time of any chance of getting a perfect C. O. routine. Scratches, punch marks, paper stickers and the like have always been held in disfavor; but are the new S. R. P. marks any improvement. Cue sheets formerly were used here, and most projectionists I meet claim that this system was satisfactory in every respect—certainly preferable to the S. R. P. plan. Even now at our own theatre we prepare our own cue sheets at rehearsals, and we favor this method above all others. I am of the opinion that all projectionists who strive to give their patrons the best possible picture feel the same way about this S. R. P.—T. H. BROWN.

#### —Rock Island, Ill.—

Sir: While I think all projectionists will acknowledge that great credit is due the P. A. C. and other organizations which are striving to improve

In other words, if we wish to get a true stereoscopic image of all objects it would be necessary for us to have four eyes in our heads—two in a horizontal and two in a vertical plane.

The limitations of space prevents further reference here to experiments in this field, which is at once the most interesting and the most hopeless of all those confronting research workers in cinematography. Whether it is a human possibility is open to question. I doubt it.

change-overs, I can think of little to say in favor of the S. R. P. The dot idea is poor, as it requires too intense a concentration on the part of the projectionist who, if he should turn away at what might be termed the "psychological moment," would miss the markings. The audience *does* notice the S. R. P. dots, and this is something we have been striving to get away from.

Numbering the frames for starting is a very good idea, although M-G-M apparently does not follow this idea closely. Although no complaints have been made about damaging film at the various starting frames, there is considerable mutilation at the start of the reel—which is the worst possible spot for any damage. Many of the producers are not "toeing the mark" with respect to S. R. P. markings, and this discourages the projectionist and causes him to think seriously of protecting himself by making his own markings on *all* films, whether standard markings appear or not.

Of course, any one can criticize and sidestep the necessity for offering a substitute; yet I feel that a study of prevailing opinion among projectionists will make the solution of the problem that much easier. The cause of much of the trouble lies in the wide variation in motor pick-ups. Standardize on this item, and much of the current trouble will be eliminated. I hear the impending howl about "research and expense," but this excuse will not serve to explain away a matter as important as a good picture on the screen.—R. STIMPSON.

#### —Delphos, Ohio—

Sir: We have received a number of Standard Release Prints at our theatre (500 seats), and we have yet to come across one that has not been cut in some fashion. Invariably reels 1, 3, 5, and 7, have been cut. Moreover, at the ends of reels 2, 4, 6, and 8, blank leader up to within four frames from the change-over have been received. This makes a good change-over very difficult. The problem demands mutual agreement between exchanges and projectionists to see that S. R. P.'s are kept standard, with some sort of check-up on both these agencies provided for. To receive a print with perfect signals (invisible signals, incidentally), would be a welcome relief to all projectionists.—W. R. NUSSBAUM.



# **A Capital Investment**

**that keeps on  
paying its own way**

**THEATRES** can no longer continue to operate profitably without the best sound.

**WESTERN ELECTRIC**—the world's sound standard—is a real capital investment—the same as a well-built house, comfortable seats, attractive decorations—all paying their share of dividends

**WESTERN ELECTRIC** assures you unmatched apparatus—made to Bell System standards of precision and quality by a company in business to stay. It guarantees you patent protection.

**ERPI SERVICE**, too, prevents costly breakdowns—maintains highest possible quality of reproduction.

***That's why Western Electric is a profitable, capital investment***



**Northern Electric in Canada**

*Distributed by*

***Electrical Research Products Inc.***

250 West 57th Street, New York



# The Pentode: Its Structure and Function

By Engineering Department, Aerovox Wireless Corporation

ONE of the latest tubes to be brought to the attention of the engineer and the experimenter is the pentode, a power output tube of rather unusual characteristics. Active experimental work on the power pentode was undertaken in this country about a year ago, but it is only recently that this type of tube became commercially available; a tube of this type is now being made by all the prominent tube manufacturers. It appears likely that a number of manufacturers will make use of this tube.

Since the power pentode is being given such serious consideration, it may be worth while to discuss in some detail the characteristics of the tube with special reference to its difference in comparison with ordinary types of power tubes. The power output pentode designed for use in a. c. radio receivers (used in this article for comparative purposes only), has the following characteristics:

Filament Voltage ..	2.50 volts
Filament Current ..	1.5 amperes
Plate Voltage recommended ...	250 volts
Space Charge Grid Voltage recommended .....	250 volts
Control Grid Bias ..	16.5 volts
Plate Current .....	32 milli-amperes
Space Charge Grid Current .....	7.5 milli-amperes
Plate Resistance ...	38000 ohms
Mutual Conductance.	2500 microhms
Load Resistance approximate .....	7000 ohms
Power Output .....	2.5 watts

The pentode is a five-element tube, the various electrodes being arranged as shown in Fig. 1. There are two additional grids in the tube besides the usual control grid found in the ordinary tube. Immediately surrounding the filament is the space charge grid. Outside of the space charge grid is the control grid and it is this grid which corresponds to the grid found in ordinary power tubes as, for example, the type 245. Surrounding the control grid is placed the cathode grid and around the outside of this grid is the plate. The manner in which the tube is connected into an actual circuit is illustrated in Fig. 2. The inner or space charge grid is connected to B plus 250 volts, the con-

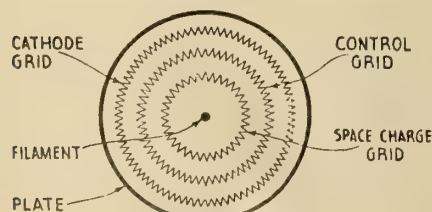


Figure 1

trol grid is connected to the secondary of the input transformer, the cathode grid is connected inside the tube to the center point of the filament and the plate is used, of course, to supply the power to the loud speaker.

## Higher Mutual Conductance

In an ordinary three-element power tube, the electrons emitted by the filament congregate about the filament and build up what is termed a space charge. In the pentode the space charge grid prevents the space charge from building up about the filament, and in this manner a much larger number of electrons are subject to the control action of the control grid. The practical result is that the pentode tube has a much higher mutual conductance, i. e., a much larger change in plate current for a given change in grid voltage than can be obtained in ordinary three-element tubes.

The cathode grid located between the control grid and the plate serves to prevent secondary emission. The cathode grid is tied directly to the filament and in practical operation is therefore always somewhat negative with respect to the plate, being highly negative during those portions of the output cycle which result in low plate current. It is found in practice that the pentode tube shows but slight secondary emission effects except at very low plate voltages.

Besides having a very high mutual conductance (2500 microhms), the tube also has a high amplification factor. Whereas, the 245, for example, has an effective voltage amplification (a. c. volts across the load divided by a. c. volts on the grid), of about 2.3, the pentode has an effective amplification of about 11. As a result of these two characteristics, we find that the pentode is a much more sensitive tube than ordinary three-element power tubes. By this we mean that for a given a. c. voltage on the grid it will supply a much greater amount of power to the loud speaker. If we compare it directly with the 245, we find that this tube requires 36 volts a. c. on the grid to deliver a power output of about 1.5 watts. The pentode, on the other hand, will supply 2.5 watts of power and requires only 11.5 volts a. c. on the grid.

## Serious Distortion Factor

But in the use of the pentode considerably greater care is required in the design and arrangement of the associated circuits than is required when using other types of power tubes. Whereas, the amount of distortion produced by a three-element tube is

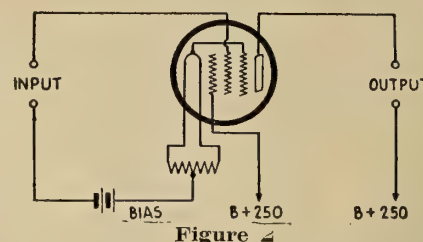


Figure 2

quite slight and decreases the higher the load resistance, the distortion produced by the pentode is low over only a small range in output load resistance, and the distortion becomes greater if a load resistance is either greater or less than those values which give minimum distortion.

Also in an ordinary three-element tube it is not difficult to eliminate the common coupling between input and output circuits which tends to occur because the grid bias resistance is common to both circuits. In the pentode, on the other hand, this type of coupling is quite severe and is not so readily prevented.

First let us examine in further detail the manner in which common coupling occurs in the C bias resistance and means by which it can be eliminated. When C bias is obtained by means of a resistance placed between ground and the center of the tube filament, we obtain a circuit arrangement as shown in Fig. 3.

The pentode requires a bias of 16.5 volts obtained from the voltage drop across the grid bias resistance R, and it follows that, since the plate current of the pentode is 32 milli-amperes and the space charge grid current 7.5 milli-amperes, and both of these currents must flow through the C bias resistance, the value in ohms of this resistance will therefore be

$$R = \frac{16.5}{0.032 + 0.0075} = 418 \text{ ohms}$$

When an a. c. voltage is applied to the grid, a. c. currents are produced in the plate circuit of the tube, and if the a. c. input voltage has a peak value equal to the bias on the tube, the peak a. c. value of the current in the plate circuit will be equal approximately to the normal d. c. current. In the case of the pentode we can assume, therefore, that with an a. c. voltage of 16.5 volts peak applied to the grid, the peak value of the a. c. plate current will be about 30 milli-amperes.

This a. c. current will flow through the load, through the B supply circuit, hence through the C bias resistance and back to the filament of the tube. As a result there will be an a. c. voltage drop across this C bias resistance which voltage drop will be



equal to the r. m. s. value of the a. c. current multiplied by the resistance in ohms. In this case the drop across the C bias resistance would therefore be  $0.03 \times 418$ , or 12.6 volts a. c. peak value; and the r. m. s. value would be 12.6 divided by 1.4, giving 8.97 volts. This voltage would be re-impressed on the grid circuit and, being exactly opposite in phase to the original a. c. voltage applied to the tube, it would result in a considerable reduction in overall amplification. If the tube is to give satisfactory performance the a. c. voltage drop across the grid bias resistance must be reduced to a very low value.

A method of accomplishing this is to shunt the C bias resistance with a condenser which lowers the impedance of the circuit and results in a lower voltage drop. In the case of ordinary types of power tubes, a capacity of one or two microfarads proves quite effective, but because of the much higher sensitivity of the pentode ordinary sizes of condensers do not give very effective results; this can be attributed to the fact that not only is

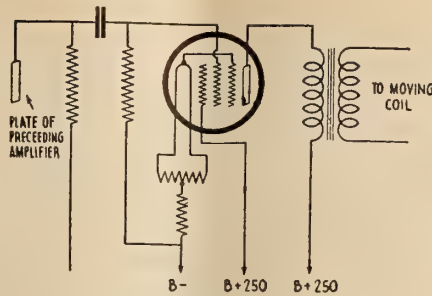


Fig. 3

the tube more sensitive but also because it requires a comparatively low value of C bias resistance and hence a much larger condenser is needed to produce a given reduction in the impedance of the circuit.

Regarding the matter of output transformer ratio it appears that the impedance ratio should be such that the loud speaker looks like about 6,000 or 8,000 ohms to the tube at a frequency slightly about the resonant point of the speaker; the average dynamic mounted in a large baffle usually resonates in the neighborhood of 100 cycles.

## Film Technical Progress in 1931\*

ALTHOUGH no epoch-making discovery was made during the past six months, there has been an evident improvement noted in all branches of technical endeavor in connection with sound recording, processing records, and sound reproduction. Ever since the showing of the first successful feature sound picture in October, 1927, the quality of sound reproduction has been gradually improving. The reproduction of sound reached a high level of perfection during the past winter, due to the introduction of methods for eliminating ground noise in both variable density and variable width recording. Equally significant were the marked improvements noted in the speed and color-sensitiveness of panchromatic emulsions.

Several subcommittees of this and other societies initiated the examination of the important aspects of projection, such as design and maintenance of projection rooms, screen illumination, monitoring and control of sound, and improvements in projection design. Further refinement in projector arc carbons was noted.

### Stereoscopy and Color

Although significant progress was made in a method of realizing stereoscopic pictures, one authority considered that much research will be necessary before the process will have practical value. The applications of sound pictures continued to multiply as government bureaus, business organizations, and pedagogical institutions began to use this new medium of expression. Although additional improvements were made in connection with methods of televising pictures, it was pointed out that a fun-

damentally new principle must be discovered in order that such processes may enjoy universal application.

Few color pictures were made during the past six months and exhibitors came to believe that color must be regarded only as an adjunct to the technical refinement of the picture, as, in its present form, it has been shown to lack real box-office value. Faster emulsions with better color-sensitiveness, coupled with improvements in processing, strongly indicated that subtractive processes would measure up to this requirement. The need for a satisfactory, inexpensive, three-color process still prevails.

### Films and Emulsions

Concurrent with the general decline of business, which began late in the fall of 1930 and prevailed throughout the spring of 1931, there was an abandonment of the wide-film program by the producing organizations. Cost of installations in the face of a business depression and insufficient public interest in wide pictures were two probable causes of this decision. Larger screens were installed, however, in a number of theatre circuits. Warrenton suggested exposing the picture in a 3 by 6 rectangle in the area occupied by one frame on 35 mm. film, retaining the principle action in a 3 by 4 area in the center of the longer rectangle. Prints could be made of the wide picture, or the smaller area could be printed optically to fill the entire frame.

The Standards and Nomenclature Committee, however, reported at the October, 1930, meeting of the Society that the only satisfactory method of obtaining a large screen picture seemed to be by using a wider film. A plan is being studied which will permit the use of a 1.8 to 1 ratio for

the picture size, a wider sound track, more suitable margins, and a film width intermediate between 70 mm. and 35 mm.

One of the most important developments for many years was the introduction of panchromatic emulsions of increased speed and improved color-sensitiveness, particularly in the red and green regions of the spectrum. With these ultra-sensitive materials, exposures may be made under more difficult conditions of illumination than with former emulsions or a better definition and depth of focus may be secured by stopping down the lens. Such emulsions offer great promise in color photography where the difficulties of obtaining sufficient exposure have long been recognized. Greater care must naturally be used in handling these faster stocks both in the camera and in the processing laboratories. The industry is proceeding cautiously in using them, in order that the cameraman and technicians may have an opportunity to understand their characteristics.

### Super-Sensitive Film

Huse and Chambers have published sensitometric data on Eastman Super-Sensitive anchromatic film, showing it to be about twice as fast to daylight and three times as fast to incandescent light as previous panchromatic emulsions. The properties of Du Pont Special Panchromatic negative film have been discussed by White. It is stated that set illumination may be reduced 40 to 60 per cent with this product. Filter factors are correspondingly lowered.

Faster emulsions for sound recording work have also been introduced, to replace the relatively slow positive film in common use. The saving of lamp current in sound recording is a vital problem, especially on location, as any reduction in the number and required capacity of storage batteries adds to the mobility of sound recording equipment. A negative sound emulsion is desired that would reduce present lamp current requirements about 50 per cent.

A much smaller production of feature pictures in color was evident during the past six months than in the previous year, but trade reports indicated that there was an increased use of color for short features. Two industrial pictures were made by the Multicolor bi-pack process. Another bi-pack process called "Magnacolor" was announced. A direct color process claimed to be applicable to motion picture film was announced as being available for exploitation in Germany. Colloidal silver emulsions are used which are developed in a closed container with the vapors of formaldehyde, ammonia, and alcohol.

### Sound Recording

According to Knox, the problems of the sound engineer are: (1) extension of the frequency range of recording and reproducing equipment; (2) increasing the volume range so that fainter and louder sounds can be recorded and reproduced; and (3) re-

(Continued on page 36)

\*Abstract from report of the Progress Committee of the S. M. P. E., read at the Hollywood Meeting.



# Efficient Sound Reproduction

By R. H. McCULLOUGH

Supervisor of Projection, Fox West Coast Theatres

WITH every sound installation there is a monitor horn installed in the projection room, so that the projectionist, as well as the audience, may hear the sound. The volume of sound from the monitor horn must be kept at a certain level, so that the sound cannot be heard in the theatre auditorium. A loud monitor horn will produce an echo in the rear of the auditorium if the projection room is not sound-proof.

I have found that excessive circumferences play in the intermittent movement will result in a slight lack of synchronism with Movietone reproduction. There is a very exact relation between the projector aperture and the sound gate registration. Unless it is very bad this probably will not amount to very much, insofar as it has to do with the screen effect. The projector mechanism intermittent movement must be 100 per cent. perfect, as every little fault eliminated helps toward perfection.

The loudspeaker unit is a delicate piece of mechanism which should not be subjected to avoidable shocks. When the speaker units are moved from one place to another, those who handle them should be duly impressed with the importance of being careful.

## Amplifier Hum

It is quite evident that if hum is encountered with both sound film and

disc subjects, the trouble is in the power amplifiers. Hum can often be traced to defective shorted vacuum tubes, either in the stages preceding the last stage or in the last stage itself. Unbalanced rectifier tubes will cause a very bad hum. Worn out tubes (low emission), frequently cause squealing and howling. If popping or crackling noises are perceptible at high volume levels this trouble can often be located in the base of one of the 211-E vacuum tubes in the 43-A amplifier, or in one of the 205-D vacuum tubes in the 42-A amplifier.

The first point to remember is to check the tubes and take nothing for granted. Excessive hum can be caused by shorted by-pass condensers, open secondary to input transformers and bias resistors, shorted filter chokes and filter condensers, although the latter condition will manifest itself in overheating of the rectifier tubes and power transformer. Great care must be exercised to see that the input wiring to the amplifiers is well shielded from all A.C. wiring.

Occasional band hum can sometimes be traced to the fields from adjacent electrical equipment, such as mercury arc rectifiers, rotary converters, motor generator sets and small motors. The A.C. circuit, which feeds the power amplifiers and rectifiers, should always be run independently and

should never be on the same circuit with any other electrical appliance.

The best method to find out definitely if the hum is caused by some other electrical appliance is to turn on the amplifiers with all the other electrical equipment turned off:—if you find that the hum is not in the amplifiers, turn on each electrical appliance individually until you find the one which is causing the frequency hum during the time the amplifiers are in operation.

MANY recent requests for further data on wide film suggest the desirability of stating that not much progress has been made in the wide film field since the introduction of Grandeur late last Summer. Of course, various agencies have been concerned with a consideration of the technical aspects of this question, but nothing of importance other than a statement of the "ideal" size for wide film has been forthcoming as a result. Improved economic conditions will undoubtedly induce further work in this field, which is very quiet at present.

As for additional data on the wide film system, nothing new is available, although it might be well at this time to review briefly our earlier comments on wide film presentation.

The proportion of the Grandeur picture (one-to-two dimension), is very close to the normal angle of



Oceans of clams and about twice as much . . . , in addition to a few thousand squabs and other knick knacks of food were disposed of by this husky-looking (we almost said hungry-looking), crew



vision, which seems imminent as a standard proportion for the wide film projected image. Grandeur film has an important feature, due to the larger image upon the film and the grain is not so apparent on the screen as it is with the 35 mm. film when projecting Magnascope, which is merely magnification.

#### Wider Track Desirable

Sound, which has made the motion picture vibrant with music and speech, is greatly improved with the Grandeur sound track, which permits a much greater volume-range in recording, and correspondingly greater volume and tone quality in reproduction. A few years ago, when the sound track was added to the motion picture film, it was found that the picture area did not allow enough characters to be included in a scene. To meet this situation and to improve conditions, work was started on the development of the wide film, which finally resulted in the Grandeur projection.

Projection offers plenty of difficulty with short throws (distance between the projection screen and objective lens), when it is desired to obtain a picture of satisfactory width. At the present time, there are no lenses which can be secured under four inch equivalent focal length, which will give satisfactory results with Grandeur.

#### Special Lens Needed

An ordinary projection lens is entirely out of question, except in the longest focal lengths, because of objectionable curvature of field. It is necessary to use anastigmat lenses to obtain good definition, because of the wide angle. It is also necessary that the objective lens rear combination

be of sufficient diameter so as to collect the area of light rays from the aperture—otherwise, loss of illumination will result at the sides of the projected image, which will be apparent by shadows.

The better the definition of the Grandeur picture, the closer the front seats can be to the screen. If the Grandeur picture image is increased over fifty feet in length, magnification will result, which will spoil the illusion of objects. Where Grandeur is projected at an angle of more than 15 degrees, it is necessary to use prisms to reduce the vertical distortion to a minimum, so as to reduce the elongation of objects, which is very objectionable when viewing the picture from the side seats.

#### Problem of Illumination

It is imperative that the Grandeur screen be well illuminated. At the present time, there are no carbons manufactured to permit using over 170 amperes at the projector arc. Approximately 13 foot candles of illumination is required for satisfactory projection. Super-Hi-Intensity Lamps must be used to obtain the correct amount of illumination. With the Grandeur aperture 1.768 x .885, and by using the ordinary 4½ in. plano-convex condenser combination, the illumination area is greatly reduced when the area of the aperture is circumscribed.

It is obvious that if the same amount of light, which passes through the aperture in an ordinary projector, be spread over a screen area twice as large the screen illumination would only be half as great.

One obvious means of increasing the illumination is to employ condenser lenses of larger converging

angle. About 25 per cent more illumination can be obtained if the rear condenser lens (next to arc), has a cylindrical surface. Such a condenser will yield an elongated spot of light equal to that of the rectangle, without loss of light.

It has been indicated that the relatively enormous picture on the screen may prove more satisfactory at a level of brightness lower than that to which we have been accustomed with the standard size picture. However, with the facts at hand concerning this matter, the requirements for illumination of the Grandeur picture are similar to those required for the standard size picture.

#### Condemns Varying Motor Speed

It would appear that one of the greatest beneficiaries known to talking picture apparatus is being grossly abused by thoughtless people. The unit to which I refer is the Motor Control Cabinet, a decided advantage over all other methods for the precise regulation of speed of electrical motors. Until I saw for myself I would not have believed that such a practice would be tolerated.

So sure was I that the Western Electric Company did not know of the facts that I promptly wrote them, and gave them what information I had. To think that exhibitors would purposely destroy the greatest refinement over all other reproducing sets by cutting out the control of speed to suit temporary box-office requirements, seems preposterous. Any projectionist who aids and abets such an order by carrying it out must surely be a weak-kneed nincompoop. But this stupid trickery must surely have its effect on box-office receipts, especially when it becomes evident to the patrons that he can hear better at the opposition.

Many projectionists will undoubtedly remember only too well the troubles of the "silent" days—when we were in repeated conflict with the musical directors over irregular projection speed. Even the face of the best speed indicator would be made to appear a liar by the musical director should his music fail to pan out to the cue given on the "suggestion" sheet without a repeat.

How we prayed in those days for that "something" that could not be disputed in the form of dead right speed. Now that prayer has been answered, the Motor Control Cabinet is our indisputable reply. In those days a musical director would earn anything from seven to twenty pounds a week for a four-and-a-half-hour day.

For moral interpretation only, let me explain that it would be better for us, as projectionists, to look well after what we hold, lest history repeat the sad story.—DAVID ROBSON in *The Bioscope* (England).



which attended the 4th District Convention at Easton, Pa. Local 203 did the honors in splendid fashion.



# The New York Times.

SUNDAY, NOVEMBER 2, 1930.

## IN THE PARAMOUNT PROJECTION BOOTH

THE motion picture has found its voice, but the discovery has not subtracted from the work of the exhibitor. Sound mechanism has, in fact, given audience a new critical sense of the fitness of things cinematic and has resulted in new problems. Talking pictures are no longer novel and they cannot presume to get by in the face of the little flaws in sound reproduction which once went unnoticed.

Every sound on the motion picture is recorded by the microphone and is reproduced in the theatre. Once recorded, it cannot be removed without destroying every other sound in that particular section of the row track which runs alongside the film. But that is only half the story. The aggravating truth is that any deviation of the sound track and any deviation of the delicate instruments in the projection machine are also duly heard.

A speck of oil or dirt is detected by the photo-electric cell and reproduced as an individual noise, usually grotesque and discordant. A spot of ink on the sound track, as many projection room mechanics have found to their sorrow, comes out with a most obnoxious rattle and bang from the amplifier. A thumb-nail scratch produces a major explosion with minor noises like the sound of flying shrapnel.

**A Special Observer.**  
The show hangs by threads and hairlike springs in the mechanism, more than a sound reproduction is there is a human equation to consider, and everything else functioning depends on this. The projectionist is the one who makes the difference between the shouting of feet, applause, and only remotely to the men in the projection booth.

Every day in the week a general inspection of the talking apparatus takes place an hour before the first show. All electrical connections are checked, storage and dry batteries are examined and the quality of the sound reproduction is tested. Each of the six loud-speaker horns behind the screen is tested individually and observers listen for defects.

But flaws cannot be eliminated entirely. They can only be minimized. Frequently studios send out projectionists and nothing basic faults which can do well in the studios. Six prints of the Gloria Swanson picture "What a Widow" were rejected here and even the one finally selected for the premiere was imperfect.

At a recent luncheon of the Projection Advisory Council Mr. Carnegie had a point near him. He found himself in a water, clothes and the upset were back in their own north ward. The fair play of the wide, Mr. and Mrs. Ellingboe of St. Cloud, Minn., and Mr. and Mrs. Tiller of Northfield, Minn., were also present.

## PROJECTIONISTS DENY ALL BLAME FOR POOR SOUND

Operators Claim All Noises in Talking Pictures Are Not Their Fault

It seems that there has been a tendency among the movie reviewers and the more restless of movie patrons to blame those mysterious persons in the projection room when anything goes wrong with the sound in talkies.

Apparently the impression prevails that the experts who manipulate the sound apparatus in the theatre are wholly responsible for the results, good or bad. And now projectionists have emerged from their sound-proof boxes to protest through the spokesmanship of their leader, Mr. William F. Carnegie, against the contumacious habit of being unjustly blamed.

At a recent luncheon of the Projection Advisory Council Mr. Carnegie had a point near him. He found himself in a water, clothes and the upset were back in their own north ward. The fair play of the wide, Mr. and Mrs. Ellingboe of St. Cloud, Minn., and Mr. and Mrs. Tiller of Northfield, Minn., were also present.

equipment may be to blame. To "Experience" has demonstrated our large first-run houses are delivering an inferior quality of sound, not because of any neglect, carelessness or ignorance on the part of their technical staffs but because they are very badly suited to the showing of sound pictures.

"Some of the best sound and dialogue, on the other hand, is being offered by smaller houses where never put in an appearance, the houses labor under no such smaller handicaps as the large theatre houses, which were constructed to accommodate audiences for silent pictures."

"In by far the majority of cases the projectionists are getting out of their sound equipment about all that is capable of accomplishing. They are doing a conscientious job but they cannot be expected to overcome the handicaps of bad projection, substandard equipment, which has been installed in many theatres, and the factor of reverberation, which is too often an al-

most insuperable obstacle. "The projectionists of the country have done a remarkably good job in connection with the introduction of sound. They should not be compelled to defend themselves against wholesale criticism for results which are wholly beyond their control."

It might be a good idea for some one to appoint an impartial committee to investigate and report on the causes of the execrable sound conditions in several recent talkies. They could start with "The Rogue's Song."

SUNDAY PITTSBURGH PRESS

MARCH 1, 1931.

# Phantoms Of The Movies

THEY MIGHT be called the phantoms of the movies, the men you never see, and without whom the show would not go on. And they live up near the roof, far back in the house. When things go well nobody pays any attention to them. But just let a "break" come in the film and silent round of impatient invective is theirs. Movie fans are impatient persons.

But that seldom happens any more in the big movie theatres, so most of the time they are in the role of phantoms.

A few years ago, however, it was common to see this apology flashed on the screen:

"There will be a brief recess while we patch the film."

During that time the spectators would turn in their seats, stare at the tiny box-like structure, and condemn the operator for being a clumsy ox.

But now the projection department consists of the Penn Theater, for instance, has seven different rooms devoted to this phase of its theater.

ON THE very top floor there is a battery room, the generator room, the projector room, a rewind room where the rolls of film are rewound on metal proper, a wash room and the blower case, a wash room where the machinery for keeping the air in the projection room free of the carbon odors and smoke.

Instead of the lone projection machine, which used to occupy the old-time "pigeon-hole" there are eight complicated looking pieces of machinery which look more like great battery of anti-aircraft guns than anything else in the world.

There are three men on duty all the time, operating this \$45,000 worth of equipment, and they have their hands full, too. In the old days the operator had only to know how to turn the crank and patch today he must have a sound knowledge of electricity

which plays such an important part in the ordinary silent projection machine as well as the new sound machines.

During the feature picture and the travel news, the operators have to stand guard and regulate the sound which is being produced either by disks which are synchronized with the film or are being produced directly by sound film through the medium of the photo-electric cell.

The operator can make these voices medium of the photo-electric cell in the screen either smooth and well modulated or if he is careless he can make them harsh and scratchy.

While the stage show is on, at least two operators are on the job with the spot lights, following every move of the performers. They have a regular routine planned for each stage presentation. All of which goes to show that the man in the booth today has a job that is always changing with the steady development and evolution of the movie industry.

Every improvement has meant new things for the operator to learn and they will not be surprised by anything that the future may hold in the way of innovations in projection of pictures.

Now for a bit of history for a truer appreciation of the improvements made in the projection machine during the past five or ten years. Motion pictures are older than the Christian era. In 55 B. C. Lucius demonstrated the phenomena of revolving spots so that they looked like a continuous line, much like the revolving of a fan.

The ancestor of the animated cartoon of today, which is a series of individual drawn pictures, was the first actual form of moving pictures. It was used as a toy and only one person at a time could see the "movie" as these individual pictures were passed rapidly before his eyes.

Finally the principle of this toy was combined with the stereopticon so that the audience was interested in the projection of the pictures on the screen. Then came the development of instantaneous photography and celluloid films.

While Robert Paul and others in England and France and Edison in America were known to be working on moving picture projection machines, a young man by the name of C. Francis Jenkins, working as a clerk in the Treasury Department, invented such a machine. After two years work he sent it to his home in Richmond, Ind., and proceeded to put on the next real moving picture show for friends and neighbors. He had to borrow his electric current from a nearby trolley wire and run it through an improvised generator, but the machine worked. The film which he showed at this unquiet show was "Annabelle the Dancer." The date for this showing was June 6, 1894.

Jenkins later went into partnership with another young man by the name of Thomas Armat. In 1895 he sold his interest in the invention to Armat for \$2,500. That is all the Jenkins realized on his invention of the motion picture projector which has made possible the fifth largest industry in this country.

## MOTION PICTURE PROJECTIONIST

March, 1931

Vol. 4, No. 5

JAMES J. FINN, Editor

**Congratulatory Council's Second Birthday**  
Projection Advisory Council are in order for the day which was marked by its second annual meeting held in New York. A review of the work done by this organization in the few months it has been in existence would reflect credit on an organization many times its size and with ample financial resources. But when it is considered that the Council has not received the wholehearted support of all projectionists, and has had but a few men who would actually take off their coats and go to work for it, its accomplishments are little short of astonishing. Its publicity work alone is invaluable, but it has a record of work accomplished which has been productive of more tangible results.

Here certainly is an organization which is worthy of the support of every projectionist. That work which is now being done by a few loyal workers could be increased tremendously in value for a project of this sort is all very well, but the organization requires financial support, too. Surely it would not be asking a great deal to solicit some slight degree of financial support, too, from every Local Union. The Local need not life members of the Council, but it might reasonably make a flat yearly payment for all its members. And this brings us to another consideration.

It might well be asked just why Local Unions should render assistance to the launching of reformers the net result of which is to save money for producers and exhibitors. While it is true that the Council has lent itself to various plans for effecting economies for these branches, it should be remembered that the Council is primarily a projectionist organization and that all its activity is predicated on this basis. The projectionist comes first, and anything which contributes even in slight degree to the advancement of his interests will have the support of his in-siders. The Projection Advisory Council merits and should have the support of every projectionist in this country and in Canada.

Illustrating the value of an organization like the Projection Advisory Council: material relating to the advancement of projection and the increasing importance of the projectionist as it appeared in various publications





Size (35mm.) of ordinary picture—and size of compressed Fulvue picture

Size (as expanded on screen) of the compressed Fulvue picture (shown at left)

## Wide Image From Standard 35 mm. Film

*Europe has manifested as keen an interest in wide film developments as has America, and announcement has been made of several methods designed to secure a wide image from standard film. One of the most interesting of these processes is the "Fulvue" system which embodies a "squeeze" method of impressing a wide image on 35 mm. film. This process, which occasioned much favorable comment when demonstrated recently in England, is described in the accompanying article.—Editor.*

**T**HE principle of the Fulvue process is based on the lateral compression by optical device of a wide field, with the image registering on 35 mm. film. This "squeezed" wide field passing through the projector is expanded to the original wide proportions by means of a corresponding reverse lens attached in front of the projector. The Fulvue standard of width of the projected picture is in the ratio of one-and-two-thirds to that of the present ordinary picture.

In theatres where it is physically impracticable to install a full standard-width screen, a picture expanded to the exact local requirements is easily arranged for and length of "throw," varying as it does with each theatre, is also provided for.

The essence of the Fulvue process centres in the fact that there is no departure from the standard width 35 mm. film, with consequent scrapping of the present standard makes of cameras or projectors, such as would have been necessary with any departure from the 35 mm. width of raw stock. Recent wide-film experiments in America, where different widths of films were employed, involved the use of special cameras and projectors, with consequent great expense to producers and exhibitors, in addition to the increased cost of the wider raw-stock itself. And this disadvantage is certainly absent from the Fulvue process.

For operation of Fulvue in theatres a wide screen and a lens attachment (which also permits of the lens being swung aside when not in use), for the projectors are the only essentials.

As many theatres are at present equipped with some kind of wider screen, it would appear that any exhibitor wishing to install could do so at reasonable cost.

In the studio, and on "location," no special camera is required. The Fulvue lens is attachable to the ordinary standard camera.

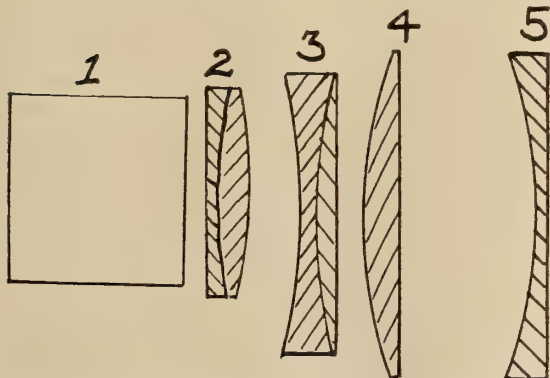
A similar optical system is used both for camera work and for projection.

In photographing, the receiving lens obtains a very wide field, which is impressed on the 35 mm. negative in laterally compressed form, in much the same way that a distorting mirror "squeezes," say, a fat figure into a narrower image. This image in 35 mm. form passes through the projector, and is expanded on emerging to its original proportions on reaching the screen by its passage through the Fulvue projection lens, with the distortion corrected. The resultant picture on the screen is of full stage width, but of normal height.

The optical system consists principally of a pair of compound achromatic cylindrical lenses, concave and convex. In conjunction with the cylindrical system are two ordinary spherical lenses of similar focus, and adjustable as to their separation.

Aberration is overcome by the use of these latter, which correct the rays into parallel.

The process involves no re-photographing from wide down to narrow film; wide expansion of view is obtained without magnification, and the image is normal in height. The field of natural vision is covered, affording producers scope for pictorial effect, which is seen to greatest advantage in landscape and outdoor scenes.



The Fulvue Lens system: 1. Ordinary camera or projector lens. 2. A chromatic cylindrical lens (positive). 3. A chromatic cylindrical lens (negative). 4. Positive spherical lens. 5. Negative spherical lens

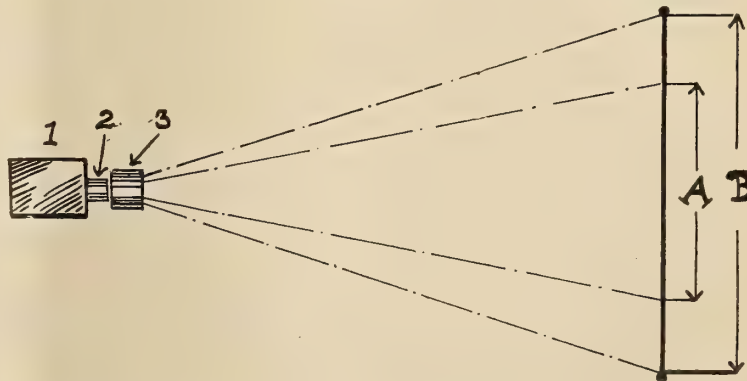


Diagram of Fulvue Apparatus: 1. Camera or projector. 2. Ordinary lens. 3. Fulvue lens. A. Ordinary lens field. B. Fulvue field



# Projector and Accessories Improvements

The accompanying article is an abstract from the report of the Practical Projection Committee of the S.M.P.E. The work of this committee, of which Harry Rubin is Chairman, is generally regarded as having been the finest contribution to theatre projection work within the past decade. Members of the sub-committee which drafted the report from which the accompanying article was abstracted are: Herbert Griffin, Chairman; Lester Isaac, Jesse Hopkins, and Samuel Glauber.—Editor.

**T**HIS Sub-Committee was formed to analyze certain difficulties in connection with motion picture projection and sound reproducing equipment and to suggest remedies therefor. The difficulties brought to the Sub-Committee's attention by the Projection Practice Committee of the whole, were as follows:

- 1—Inaccessibility of various parts of the projector due to design.
- 2—Scratching of film while in transit through the projector.
- 3—Oil reaching the film during projection, due to leakage from various parts of the projector mechanism.
- 4—Difficulty experienced in replacing mechanisms when used in connection with sound reproducing equipment.

In connection with point No. 4, the members of the Committee particularly stressed the difficulty experienced in replacing mechanisms in emergencies, and demanded that a method be found whereby the troubles could be eliminated. The members of the Sub-Committee were asked to enlist the aid of the manufacturers in solving the problem.

## Inaccessibility of Parts

Regarding inaccessibility, the Sub-Committee has attempted to overcome this condition. To date, some progress has been made and the Committee hopes to present a solution of the condition in the near future.

## Scratching of Film

This matter was discussed at length by the members of the Committee,

and the suggestion made that the tolerances between the magazine rollers be increased to such an extent that there is no possibility of the film coming in contact with any metal when passing through them. It was pointed out that as a fire prevention measure the National Board of Fire Underwriters' Laboratories require definite dimensions maintained at these points. They allow sufficient leeway, however, so that if the film is not buckled there is no danger of it coming in contact with metal parts, except at the sprocket holes.

It was also pointed out that scratching of film may take place as a result of the projectionist allowing the film actuating parts and film guides to become worn to such an extent that the few thousandths of an inch clearance allowed are worn down. It is obvious that it is necessary that these parts be carefully watched and replaced when such wear takes place.

## Intermittent Causes Leakage

There was considerable discussion with respect to this subject; and it was pointed out by the manufacturers that this difficulty was prevalent only on the older type of equipment and that improvements had already been made available to eliminate this.

One of the greatest offending assemblies causing oil leakage was the intermittent movement which must normally be kept filled with oil to a certain level. Indicating sight glasses are placed in the oil box so that the projectionist may observe when the oil level is at its proper height. In the older type of equipment these oil sight glasses were cemented-in to the casting and the cement in time disintegrated in places, allowing the oil to seep through. Also, in the older type movements the shafts were so designed that there was no provision to carry the oil back into the oil chamber when the bearings became slightly worn. In the present type of equipment these difficulties have been eliminated and the accompanying drawing shows how this has been done.

At section B (Fig. 1) is shown a view of the intermittent casing and

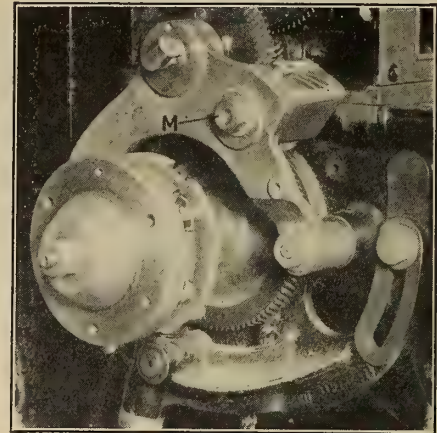


Figure 2

at A are shown the new type oil sight glasses. Instead of cementing these glasses in, threaded bosses have been provided into which is first placed a washer, then the glass, then another washer, and the entire glass assembly is tightened up with a packing nut. Two of these oil sights are provided, and by the method above described, oil leakage at this point is entirely eliminated.

## Other Offending Assemblies

Oil leakage from other parts of the movement is prevented by the use of felt washers under pressure as shown at W-232-BB and W-227-BB. Oil is prevented from seeping through the bearing for the star wheel shaft S-951 by the cutting of a reverse groove in this shaft which acts as a pump and carries any oil seeping out of the intermittent casing back into the case before it can reach the end of the bearing.

These improvements can be had and may be assembled to any existing projector using this type of movement. It is only necessary that the movements be rebuilt in order to eliminate oil leakage from this source.

The oil leakage difficulty has also extended to practically all of the other shafts in the older type projectors; but this has been obviated in the more modern equipment by the cutting of a reverse spiral groove in all of these shafts which carry the oil in the opposite direction to the side of the projector mechanism into which the film is threaded.

## The Shimming Problem

This has been a very serious problem since the introduction of sound reproducing equipment, but is only prevalent in connection with that equipment known as the D-Spec. attachment. This was the first attachment made and consideration was not given at that time to the varying tolerances allowed by the manufacturers of the projector prior to the

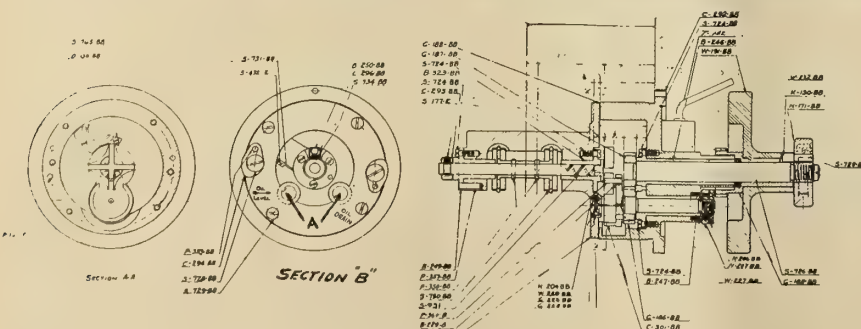


Figure 1



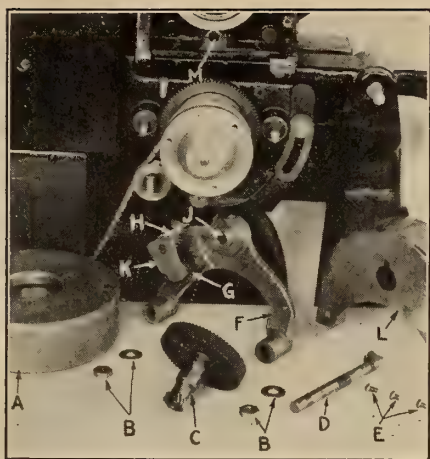


Figure 3

advent of sound-on-film. It was pointed out that it was not necessary to machine rough castings to which nothing was to be attached when projecting silent pictures, but great difficulty was experienced when sound attachments were added to these un-machined surfaces. It became necessary to use shims running all the way from one-eighth of an inch down to one-thousandth of an inch on the several corners of the mechanism in order to properly line up the projector mechanism with the sound equipment drive.

Obviously, where a breakdown occurred during the running of a show, several hours or more would be required to adjust a mechanism. Since the majority of theatres in this country are equipped with only two sound-equipped projectors, it meant that the theatre where the breakdown occurred would be left with only one projector to run the show, until the repair on the other projector had been completed. This, in turn, made it impossible to give an up-to-date and smooth performance.

The matter of solving this difficulty was put up to the manufacturers of both sound equipment and projectors, and an attachment has now been developed which eliminates the necessity for shimming. This attachment is entirely flexible and by its use the difficulty of replacing mechanisms on this very old type sound attachment is entirely surmounted, so much so that mechanisms may be readily changed within fifteen or twenty minutes.

#### New Attachment Available

Figure 2 shows this new attachment. It is only necessary to remove the gear retaining yoke from existing D-Spec. attachments and replace it with the new yoke and idler gears shown in the picture. This yoke is self-centered on the driving spindle for the projector mechanism and it is only necessary to insert the spindle in the bearing and push it through into the hole provided in the mechanism to receive it. The yoke is then securely locked on the frame of the sound attachment and the bracket carrying the

idler gears is then so adjusted as to eliminate lost motion between the gear teeth and the driving unit. The idler gear bracket is then securely locked in place by means of lock nut M.

Figure 3 shows the assembly dismantled. At A is the flywheel always provided with the sound attachment; this is readily removed by taking out three screws. At B are the lock nut and washers for attaching the new yoke to the sound attachment; at C are the driving gears connecting the mechanism through the idler gears G and H to the main driving gear on the sound unit; at D is the spindle which slides into the hole M in mechanism and upon which the assembly C revolves; at E are the three screws for attaching protecting cover

L after unit is assembled; at F is the self-aligning yoke which carries the idler gear assembly; at G and H are the idler gears; at J is the adjustable bushing to take out end play in assembly C; and at K is the adjustable idler gear bracket.

Figure 4 shows a front view of the attachment assembled to the projector and sound unit without protecting cover and flywheel attached.

No shimming is required when this new attachment is used, regardless of the age of the projector on which it is mounted, and it is felt by the committee that this unit satisfactorily solves the problem of replacing mechanisms where the old type sound attachment is used. This attachment is now available.

## Room Routine and Maintenance

*Note: This section of the Projection Practice Committee report was prepared by a sub-committee consisting of J. L. Hopkins, Chairman; Lester Isaac, Max Ruben, R. H. McCullough and S. Glauber.—Editor.*

**A** PRINTED form should be provided for the projectionists' daily report. This form should include space for entering each film or other subject included in the performance, and blank columns for entering starting time of each subject on every performance. It should include the names of projectionists on duty with starting and finishing time opposite each name. Spaces for reports as to the condition of film, the condition of equipment, supplies needed, supplies received, irregularities and imperfections of performances should be provided; also space for record of vacuum tubes put in service or removed—with information regarding number of hours of use at time of removal.

This form may be made in duplicate; one being retained in the projection room and the other sent to the manager. It is fully as important to retain a record of the projection room, as it is with every other branch of the business. By keeping this daily record accurately, both manager and projectionist can readily determine conditions in regard to equipment and supplies. In many cases, they are thus able to eliminate waste.

#### Pre-Show Schedule

Projectionists should report each day sufficiently in advance of scheduled opening time of the performance to make the necessary horn and other tests of projection and sound equipment; to ascertain if batteries are in proper condition, observe meter readings; check projectors for equal volume; remove from charge such batteries as are intended for immediate use at least one-half hour prior to such use, and observe condition of vacuum tubes.

They should consult schedule of per-

formances, noting particularly any deviation from previous schedule; consult bulletin board for any information or cues left by other members of projection staff; clean interior of lamps and arc contacts, reflectors, condensers, objective lenses and fader; examine arc leads for corrosion and test connections for tightness.

They should lubricate projectors and run them for several minutes, noting that they maintain an even speed of ninety feet per minute; stop projectors, clean film trap, sprockets and fire rollers and wipe excess oil from bearings to prevent accumulating oil on film; check projector mechanisms for proper tension of take-up and film tension pads for proper clearances of pad rollers, fire valves, and film trap, and for tightness of all set screws of connectors.

They should then check exciting lamps for discoloration, condition of filament and proper line-up; see that sound optical system is free of oil; re-wind and examine film. If new program, re-wind and examine film prior to first showing, observe if change-over marks are properly

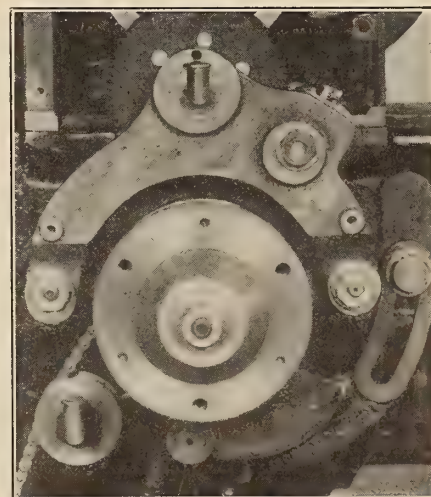


Figure 4



# As *The* EDITOR Sees IT

## ¶ *Pseudo-Stereoscopic Motion Pictures*

ANNOUNCEMENTS of screens, projectors, prisms, lens systems, and what not designed to give a stereoscopic picture upon the screen are continually coming into our office. It has got so bad in this respect that we feel something should be done to stem the flow of such announcements—if only to conserve the ink and paper on which they are written. At the same time this exposition of our ideas on this subject will give the rabid publicity men advance dope on whether their efforts will find their way into type for this publication. All releases which conform to our idea will be printed; all others will be deposited in the waste basket.

Our idea of a stereoscopic picture is one which possesses *real* three-dimensional characteristics, in which the images are as truly convex as, say, our nose, and in which we can look around the characters' shoulders and *see* a background. We are not impressed with any equipment which gives "an illusion of depth," "semblance of third-dimension," or "suggestions of relief." We expect almost any day now an announcement of a changeover which will incorporate in its design provisions for producing any or all of the aforementioned effects.

We recall a demonstration of "relief pictures" at which we met an elderly motion picture worker. In discussing stereoscopy he knowingly tapped his head and said "Three-dimensional pictures first must conform to what is in here, rather than to that which is in there,"—and he pointed to a projector standing alongside. The truth of this assertion cannot be denied. Every serious worker in the field knows that the answer to three-dimensional pictures lies in the physiological rather than in the mechanical realm.

## ¶ *One-Man Sound Picture Shifts*

ALL over the country the exhibition forces within the industry are girding for battle on September 1st next when a majority of the projectionist contracts expire. With fire in their eyes and balance sheets and ledgers in their hands will these valiant warriors sally forth to slay the demon "Labor Union." Union or non-union, they will slay anyhow, for projection room wages must come down. Isn't their theatre in the "red" to *just* the extent of the weekly wage of Projectionist No. 2? Certainly. Then forth to battle, and fight 'till the unions are down—and out.

On many previous occasions we have pointed out the faulty economics involved in the exhibitor manner of figuring costs and income. One would think that a projectionist's wage was the only item of expense about the theatre. It isn't; but if it were, then exhibitors would be "sitting pretty" just at this moment, for projectionist unions have been very nice to the exhibition end of this business. Extremely nice. Cuts have been granted all along the line, and there isn't a

single theatre in America that can honestly claim that it has not been the beneficiary of the unions' willingness to "go along" with them in these times. Not one. Have film rentals been materially reduced? Have stars' salaries been cut? Have the hundred and one things that come under the heading of accessories been slashed in price? Have pictures which still are sold for good prices been better made—have they been so much better that they please audiences much more? We think not. Then why this concentration on the projectionist as the reason for the failure of a theatre to make as much money as before? Because this is the one element in the exhibition scheme of things that is open to bargaining (shall we say "chiseling?"), the one point on which the exhibitor may work up a sentimental lather. He wouldn't get off first base on any of the other counts.

We say again that the idea of one-man sound shifts is all wrong. Would a really nice warm fire in a theatre filled with patrons ease the exhibitor's conscience? How about the use of 1,000-foot reels as a safety measure with one-man operation? Who will do the rewinding? Or should we just let the projector take care of itself in the interim? Not to mention volume control. Exhibitors have only one argument to offer against the two-man projection shift, and that is that they just don't want to pay for the second man. While we sympathize with this point of view, we are tired of seeing page 1 expositions by the trade papers of this or that theatre which has dispensed with the second man for the reason that he is not needed. He is needed, and nothing advanced by the exhibitors to date has proven otherwise.

Any Local Union that agrees to a plan for one-man sound shifts is doing itself and the industry at large a grave injustice. This tendency toward one-man shifts should be fought to the last ditch.

## ¶ *District Convention a Valuable Forum*

THE district convention, long a valuable aid to the various local unions throughout this country and in Canada, has been considerably enhanced in value this past year because of the greatly increased attendance thereat. This greater attendance at and interest in the district convention may be traced to the unsettled conditions prevailing, but we prefer to believe that it is rather the reflected growing interest of the various local unions in their own welfare as well as that of their territorial neighbors.

Valuable as have been the district conventions during the past year, we think an even greater service could be rendered the participating unions if only an additional day or two were set aside for a discussion of purely technical subjects. A forum such as this would be of inestimable worth, and we are of the opinion that once put to a test this feature of the district convention would be made permanent.



placed and if any defect, such as oil accumulations, scratches, buckling, strained or broken sprocket holes, is apparent. Such defects should be reported immediately.

Such parts of projection and sound equipment as do not require daily cleaning, lubricating or inspection, should have a designated day of the week assigned for receiving such attention. The procedure as outlined above, if properly carried out, will safeguard against film damage. Faulty adjustments or worn parts will cause film damage, which has always been a source of great loss to the industry. Film in bad condition or faulty adjustments or worn mechanisms create possibilities of film fire, with its attendant danger and financial loss.

### Running the Show

In projecting picture or effect, the projectionist should strive to avoid imposing any distraction on the audience which would serve to destroy the illusion; such as flickering light, shaking or moving the projected image. He should be constantly alert to maintain an even illumination, sharp focus; smooth change-overs, and properly-timed opening and closing of curtain. He should fade picture or effect on and off gradually, to convey an agreeable and smooth effect to the audience. He should be stationed constantly at the projector while in operation and should be promptly responsive to signals for adjustment of volume.

Where the control of curtain is not directly handled from the projection room, a pre-arranged system of warning and closing signals should be used. Such signals usually consist of a two-buzz warning to the stage which is acknowledged by them on a return buzzer. A one-buzz signal is given at the moment for opening or closing of curtains or changing screen masking for various-sized pictures.

Film should be examined after each run and checked for loose splices and scratches, and if oil has been accumulated on the film it should be wiped off and projectors checked immediately to eliminate further scratching. Projectors also should be wiped dry of oil after each reel and checked for accumulations of emulsion from the film.

Where more than one projectionist is on duty, when projector has been threaded, are trimmed and fully prepared for the showing of each succeeding reel, the projectionist completing this work should step to the running projector and relieve other projectionist to allow him to check each detail of threading and trimming, noting that proper reel has been placed in projector. This practice of checking should be firmly established in the projection room as it has been the means of discovering faulty threading and incorrect reels in time

to make correction, thus avoiding interruptions or film damage and without making such errors evident to the audience.

### Supply of Spare Parts

A minimum supply of each necessary item of spare parts should be determined upon. An accurate record of necessary spare parts and supplies should be kept by projectionists, and when items are used which reduce the amount below the minimum figure, such items should be reported under "Supplies Needed" column of projectionists' daily report.

In the ordering of parts, the correct technical designation and catalog number should be given wherever possible to avoid error in delivery. Cata-

logs of main items of equipment should be filed in projection room for reference. Parts subject to breakage, such as gears, vacuum tubes and connectors should be distinguished from parts which are subject to a gradual wear and additional precautions taken to provide against emergencies arising through such breakage.

To provide against accidental breakage of spare vacuum tubes, they should be stored in their individual boxes. Tubes, as well as other spare parts, should be further protected by being placed in a large metal cabinet containing shelves and equipped with a lock and key. This manner of storing will facilitate a rapid inventory checking of spare parts.

The proper attention should be

## Continuous (Non-Intermittent) Projection

THE publication recently in these columns of the series of papers on continuous (non-intermittent), projectors by Arthur J. Holman has elicited the following interesting comment from William C. Plank who is himself an active and very well-known worker in the art. Messrs. Holman and Plank are in agreement on the fundamental requisites for continuous projection, although they hold different views on the means for accomplishment of what they are pleased to term the "ideal projection method." Mr. Plank's interesting contribution is appended hereto.—*Editor.*

It is very gratifying to me to know that your publication has become uniform - motion - of - the - film - minded, and has become interested in the fascinating subject of continuous cinematography. For the last ten years I have vainly endeavored to interest the motion picture industry in the wonderful advantages of continuous projection; but I now realize that it is only through the active co-operation of all those who are interested in this (as you call it), most interesting of all projection topics, that it can be accomplished. In other words, it can only be done through the dissemination and publication of more information on the subject.

In recording and reproducing sound, many of our technicians have become familiar with the advantages of a uniform motion of the film. But what is more important, they have learned how to obtain it in the greatest perfection. Impedance rollers and double fly-wheels have developed a new technique that approaches perfection in imparting a uniform motion to the film, without the slightest dependence upon the accuracy of the perforations.

All of our technicians who have thus become uniform-motion-of-the-film-minded, very naturally wish to see the registration of the successive images on the film, and on the screen, likewise made to depend upon this

much more accurate and scientific principle.

### Six Major Improvements

Freeing the registration from the tyranny of the perforations, and permanently establishing it upon the principle of uniformity of motions, is the outstanding contribution of the continuous cinematograph. Six important improvements in the art are the direct results of this signal achievement. These are:

- (1) A greater and characteristic smoothness in the projection.
- (2) A restful quality that is more pleasing to the eyes.
- (3) A better rendition of the half-tones.
- (4) A more perfect and natural reproduction of motion.
- (5) An unusual third-dimension effect.
- (6) Better results in natural color projections.

Besides these six major optical improvements, there are numerous minor advantages in the continuous projector, many of which I have enumerated in various papers from time to time.

Every projectionist knows that present-day intermittent projection is far from being perfect, and has some grave defects. Nothing reveals these so well as a screen luminosity curve, which every projectionist should make of his own screen, in order to know positively what he is inflicting upon the public.

The "Belladonna condition" of the pupils, when viewing intermittent projection, and the nerve and retinal fatigue brought on by the photo-electric properties of the retina, are examples of injurious defects that seriously challenge the attention of every projectionist.

But every projectionist should know, or should be told, that there is no longer any excuse for them. The art of projection has reached its majority and can be made absolutely free from the tyranny of the perforations and these other crudities and imperfections of its adolescence.—  
WILLIAM C. PLANK.



given by the projectionists to the matter of maintaining proper level of electrolyte and the avoidance of over-charging or over-discharging will result in a full useful life of the storage batteries and, conversely, a lack of such attention will result in a very greatly shortened life and consequent waste and expense for replacement. Where generator is used in place of batteries, it will be necessary to inspect condition of commutator each day and wipe off same using cheese-cloth moistened slightly with vaseline. If this practice is regularly followed, commutator should remain in condition for perfect sound operation.

#### Exhibitor Cooperation

Exhibitors should acknowledge the good work of projectionists in maintaining equipment in best condition and should be willing to institute new ideas and install new appliances which contribute to better performance or increased efficiency.

In conclusion, it is the belief of the committee that every owner, manager and projectionist should take cognizance of the fact that the projectionist is in a position to contribute measurably to the advancement of the industry. Every projectionist should manifest a desire to conduct his work so that maximum screen results are efficiently secured.

Systematizing the routine work in the projection room is highly important, for it is only by the orderly arrangement of the many complex details that:

1. Thorough inspection, servicing and checking of equipment can be made.
2. Equitable working arrangements, discipline and harmonious cooperation between projectionists can be had.
3. Efficient results from projection and sound apparatus obtained.
4. Smoothly conducted performances secured.

fine index complete this great work.

This book is a superb piece of work and deserves a place in the library of everyone who is interested in motion pictures and sound reproduction. I can conceive of no serious worker within the field who would be without this volume. It reflects great credit upon the Academy, upon its editor and its publisher, and is a valuable contribution to the literature of the art. I recommend this book unreservedly.

JAMES J. FINN.

#### Color for Newsreels

Technicolor scenes will be included as a regular feature in Paramount's Pictorial newsreel beginning this Fall. Scenes already produced for the pictorial include one showing the training of polo ponies on a Western ranch, another showing the latest development in table china and service for summer use, and a third containing many spectacular and gorgeous close-ups of goldfish breeding which has become an important industry in the United States within the last few years.

All the Paramount Pictorial color sequences will employ the new Technicolor process which, according to a statement by Emanuel Cohen, in charge of Paramount's Short Subject Department, "will eliminate all grainy effects and produce true-to-life tints." Paramount plans to use one 400-foot sequence in color in each Paramount Pictorial beginning with the 1931-1932 issue.



### Book Review



**RECORDING SOUND FOR MOTION PICTURES.** Edited by Lester Cowan for the Academy of Motion Picture Arts and Sciences. 24 chapters, 419 pages, with glossary of terms and an index. Profusely illustrated. Published by McGraw-Hill Book Co., New York. Price, \$4.

I CONFESS to an inability to properly appreciate and evaluate the tremendous amount of technical information relating to sound motion pictures contained in this book for the reason that I was unable to immunize myself against the virus of real drama which gripped me as I read line after line of "cold" technical fact—fact which, however, sets the brain to whirling and the eye to racing in a futile attempt to capture visually the mighty canvas painted by these twosome contributors. As I read chapter after chapter of this book I wondered what in the form of a motion picture was one-half so thrilling as the means set forth in this book with which to produce that picture.

Thrilling and packed with drama this book is, but this does not imply that it is lacking in valuable information. Beginning with the brief historical resume of sound reproduction, this book fairly flies from chapter to chapter and is filled to overflowing with "meaty" technical data. This is no amateurish effort by one individual to compile from various sources enough data to make an interesting book; it is, on the contrary, a record of experiences by those men whose job it was to turn out good sound pictures, and the methods and procedure herein described are the fruits

of their method of trial by error over a long period of time.

It is unnecessary to go into detail here anent the contents of this book, to discuss each chapter. Suffice it to say that the work is of such accuracy and completeness as to satisfy the most captious critic. Lester Cowan has handled his materials in masterly fashion, and his sure touch is reflected throughout the book. Two chapters on The Ancestry of Sound Pictures and The Nature of Sound by H. G. Knox and A. W. Nye, respectively, introduce the reader to the later chapters which are grouped under the following main general headings: Sound Recording Equipment, The Film Record, Studio Acoustics and Technique, and Sound Reproduction. A glossary of technical terms and a

#### S. C. State Council Meets

South Carolina members of the International Alliance of Theatrical Employees met in Greenville recently and discussed new developments in the sound picture field and methods of decreasing fire hazards. Columbia, Charleston, Greenville and Spartanburg were among the cities represented and almost every member of the organization was present.

W. P. Raoul of Atlanta, H. A. Harrell of Asheville, N. C., and E. H. Fowler of Charlotte, N. C., were among the speakers. Mayor Mann of Greenville delivered an address of welcome. The next regular meeting of the state council of the alliance is to be held in Columbia in October.

#### Alliance Items

##### N. Y. Film Technicians Win

AFTER many months of patient negotiations, Film Technicians' Local No. 669, in New York City, has finally signed agreement with the Paramount, Fox, Warner Brothers, Pathe, R. K. O. and Metro-Goldwyn film firms, providing for the exclusive employment of their members in the various laboratories. The agreement entered into contains provisions for an eight-hour day; a forty-four hour week and double time for overtime work. This is in direct contrast to the deplorable conditions existing in this particular industry for the past decade.

##### Michigan State Locals Meet

All locals in the State of Michigan met in the city of Lansing, Mich., for the purpose of engendering a closer affiliation with each other throughout the State, as well as to discuss the different conditions existing, which each local organization will have to contend with. Much constructive information and knowledge was gained



through this medium, and the benefits derived will doubtless prove most beneficial to all local unions represented.

### Jurisdictional Conference Fruitless

In an endeavor to come to some understanding on the jurisdictional question, which has involved both organizations for some time past, conference was held in Washington, D. C., between representatives of the Brotherhood of Electrical Workers and a Committee representing the International Alliance, such meeting having been arranged by President Green of the American Federation of Labor. As neither side would concede to the demands made by the other, and each displayed an unwillingness to give up any work they at present lay claim to, the conference terminated with no alteration in the working conditions as previously carried on.

### Two-Man Sound Shifts

A certain trade publication recently carried an erroneous article to the effect that the International Office was in accord with the practice of eliminating the extra man from the projection room. Such stand is emphatically denied by the General Office, who wants it clearly understood that they have previously and will continue to urge local unions, wherever possible, to maintain this condition.

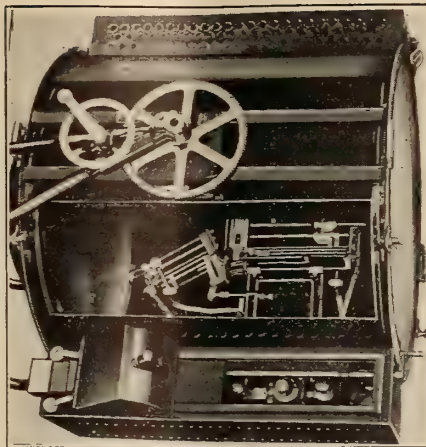
The General Office urges all Local Unions to ignore these attempts to create false impressions and sway the Unions to their way of thinking, under the guise that the information furnished is first-hand and comes from a reliable source.

### District Conventions

It is notable that attendance at the various District Conventions held during the present year has been the largest in the history of practically each District. Sooner or later every local union of the Alliance will come to realize the tremendous benefit to be gained through the medium of a properly functioning District organization, and it is hoped that in the future local unions will be as generally represented at District Conventions as they are at International gatherings.

### Speaking of Illumination

The projectionist who screens the new industrial film, which the Brooklyn Edison Company is about to shoot at its Hudson Street, Brooklyn, plant, will have no kick coming on the illumination utilized in the taking. Because the cameraman will be backed up by a pair of Hall & Connolly 180-ampere high intensity searchlights with 100,000 candlepower burners. Used in connection with standard U. S. Navy 36-inch para-



Hall & Connolly 180-Ampere Light

bolic reflectors, the lights each produce 325,000,000 beam candlepower—sufficient, if used as a marine searchlight, to pick-up a target 18 miles distant.

The film will show the interior of the plant in operation and the progress made in the installation of new equipment. It will be utilized to educate the employes of the company in the functions and management of different items of apparatus and the public to an appreciation of the vast sums and skilled labor for which the modern electric public service generation station calls.

### Quality of Television Images

By D. K. GANNETT†

IN THE processes usually employed in telephotography, the picture may be considered to be divided into a large number of small, equal-sized elements like a mosaic. Unlike the human eye, which sees the whole picture at once, the electrical eye of the transmitting machine is focussed on only one element at a time, passing rapidly along row after row of elements until the whole picture has been scanned. As each element is viewed in turn, an electrical signal is sent out whose strength corresponds to the average shade of that element.

Upon reception of the signals, the receiving apparatus recreates the picture elements one at a time, painting each dark or light as directed by the electric signals, and arranges them in the proper order to form a picture similar to that viewed by the transmitter.

It is apparent that in such a system, picture details smaller or closer together than the size of one picture element cannot be properly transmitted. The finest details which may be sent are such as would make alternate picture elements dark and light. The electric signals which would be sent out as these elements are transmitted would be alternately strong and weak, a cycle being sent for each

two elements. The frequency of this current would therefore be the number of picture elements being sent per second divided by two. Where the detail is coarser, the frequency would be lower.

It is necessary, therefore, to be able to transmit from the sending to the receiving apparatus all frequencies up to that corresponding to the finest detail—a frequency equal to the number of picture elements per second divided by two. If the wire line or the radio channel over which the currents are sent cannot transmit as high a frequency as this, the received picture will appear coarser, just as though the picture had been divided into larger elements in the first place.

No matter how nearly perfect the sending and receiving apparatus, therefore, no better picture can be received than that permitted by the frequency band which can be sent from the sending to the receiving point.

This is true equally of telephotography and of television. The principal difference between the two is in the speed of transmission. In telephotography, several minutes may be taken to transmit a picture, but in television, as in moving picture projection, it is necessary to present to the observer about 16 complete pictures per second, in order to give the illusion of motion. This means that each picture can contain only the detail which can be transmitted in 1/16 of a second.

Suppose, for example, that an ordinary 10-kc. radio broadcasting channel is to be used for television purposes. With the usual broadcasting methods, the total channel width is divided between two sidebands which are transmitted from the radio transmitter so that the highest frequency which would be transmitted to the television receiving apparatus from the radio receiving set is determined by the width of one sideband, which is 5,000 cycles. Since each cycle represents two picture elements, the number of picture elements which could be received is 10,000 in a second, or 625 in 1/16 of a second. No matter how good the television apparatus, therefore, no better quality picture could be obtained than one containing 625 elements, or about 22 by 28 elements.

### Moderate Priced Recorder

A new low-priced studio sound system known as the "Rico," employing the double system of recording and in which has been incorporated the new method of noiseless recording, besides having been especially designed for use in all climates, has been marketed by the Radio Installation Co. of Los Angeles, Calif.

The new equipment, engineers of the company claim, is an effort to meet the needs of independent and foreign production companies which cannot afford the higher priced sound equipments.

†American Telephone and Telegraph Company.



# Sound Pictures and the Projectionist \*

By CARL DREHER

Director of the Sound Department, RKO Studios

*Carl Dreher entered the sound motion picture field with a wealth of experience in the radio field behind him. He played an active role in the design and set-up of radio stations WEAJ and WJZ. Then sound pictures claimed him. First with RCA Photophone, and now as Director of Sound for the RKO studios, Dreher has enriched the industry's technical forces. Efficient volume control in the theatre has long been his pet, he having been the first to advocate remote control. The accompanying extract from a paper by Dreher should prove of great interest to all projectionists.—Editor.*

**W**HILE this paper is primarily concerned with the organizational problem of sound recording, a word may be said on the corresponding questions arising in connection with projection. The integration of sight and hearing, which constitutes the technique of the sound picture, insofar as it affects personnel, is carried out differently in the studio and in the theatre. In the studio the picture is photographed by one group of specialists, the cameramen, and the recording function has been taken over by sound specialists. But in the theatre the responsibility for reproducing scene and sound rests with one group of men, the projectionists.

With the advent of sound, it became necessary to train projectionists in this additional branch of reproduction. In many cases the projectionists' local unions instituted training courses for their members. The officials and the majority of the members of the craft showed the traditional readiness of the theatrical field to adapt men and facilities to meet new conditions. In this, a certain amount of benefit was derived from the public interest of the immediately preceding years in radio-broadcast reception. Many projectionists were amateur builders of radio receivers. While there is a wide engineering gap between home building of radio sets and commercial reproduction of sound in theatres, at least the interest was there, together with some knowledge of the rudiments of audio-amplifier and loud-speaker design. Given the normal mechanical and electrical sense of a skilled projectionist, a good foundation was available for further training.

The degree of success which has been attained in teaching projection personnel to reproduce sound effectively varies, naturally, over a wide range. Where the will to learn by

study and experience is present, most of the former picture projectionists can be taught to handle sound reproducing equipment successfully. As long as critical judgment of sound quality is required, there will remain, however, a group whose personal limitations bar them from doing a good job in this field.

## Volume Control Requisites

A man may possess the necessary mechanical training and other qualities required for good picture projection, but he may not have enough judgment of acoustic characteristics even to know when his sound projection equipment is out of order. Not everyone is capable of developing critical taste in music, and to demand it of everyone is almost as unfair and impractical as it would be to pick passers-by at random on the street and try to make first clarinetists out of them. It is true that the technique required of the sound projectionists is a less involved one, but with the gain control in his hands, and perhaps a frequency-characteristic adjustment in addition, no small amount of skilled perception is required on his part. The absence of this faculty has deplorable results from both the artistic and box-office viewpoints.

Admittedly, the problem is one of engineering as much as of personnel. The design engineers must continue their efforts to simplify theatre

equipment so that the man in the projection room need not be an engineer and a trouble-shooter in addition to his other duties. Above all, it must be recognized that in the present state of the art, a highly organized and efficient theatre-service organization cannot be dispensed with. Just as high-quality recording is impossible without a corresponding development of technical maintenance, so it is idle to expect high-quality reproduction in theatres without competent routine servicing of sound equipment.

## Remote Control Desirable

In judgment of quality in the theatres, the man in the projection room is often severely handicapped by the fact that he is listening in a noisy place on a loud-speaker which does not give him an accurate impression of what is happening in the body of the theatre. For several years it has been the writer's conviction that the only solution to this problem in the large theatres is direct adjustment of volume from a representative seat in the house. The thing cannot be done with the requisite speed and finesse through a signal system. It is too much like driving an automobile by signals from the back seat. Of course the future may see the development of automatic means of adjusting volume in projection, but as long as manual equipment must be used, it would appear that remote volume control in the large theatre is a desirable adjunct to the usual facilities, and with it a competent technician possessing knowledge of music and practical acoustics.

## Promise of the Future

Both in production and in reproduction, the complicated and delicate interaction of both men and machines stands out as the salient characteristics of motion-picture technique. When the enormously complex co-operative effort required for the production of a motion picture is considered, one may marvel at times that the job is ever effectively done, and it will not come as a surprise that the technique *per se* is often superior to the artistic result achieved. Yet at times the story, the acting, and the cumulative emotional effect of all the elements entering into the picture deserve not merely the best machinery produced by the army of motion-picture technicians, but far-improved facilities and methods of using them, which we must wait for the future to provide.

The history of the motion-picture business during the last few years gives us every reason to expect that

## Projectionist Goodwill

Cultivating the goodwill and friendship of your projectionists will pay more substantial dividends than some of the stocks you may have lying around.

The men in the projection room can not only make your screen fare better than usual, but can save you thousands of dollars annually through careful attention to the equipment, carbons, etc. Besides, they are always willing and anxious to look after little things around the theatre to show their appreciation for being treated like human beings.

These facts were forcibly brought home to us on many of our recent trips around town. We rarely pass up a visit to the projection room when we stop at a theatre. Not that we are particularly concerned over projection from the technical side of the question, but we are very much interested in the part it plays in modern theatre management.

—CHARLES LEWIS, Chairman of Managers' Committee, Projection Advisory Council, in *Motion Picture News*.

\*From "Recording Sound for Motion Pictures," edited by Lester Cowan for the Academy of Motion Picture Arts & Sciences, and published by McGraw-Hill Book Co., New York.



sound-motion-picture equipment will keep its place in the march of technological progress, and that organization, and the men whose efforts organization binds together, will not lag behind.

### Schlesinger to Renew Patent Battle Against W. E.

M. A. Schlesinger's fight against Western Electric, charging that the company's recording and reproducing equipment infringes the Ries patent owned by General Talking Picture Co. is "by no means ended," he declares. The Supreme Court recently refused to review a decision of the Appellate Court which set aside the verdict of the District Court at Wilmington, Del., and declared that the

reproducer does not infringe the patent. At that time the impression was created that this marked the end of the litigation. The suit in question, that of the General vs. Stanley Co. (which in effect was a suit against Western Electric), concerns only one jurisdiction, Schlesinger says. Suits are to be brought in other jurisdictions, he declares.

So far the litigation has concerned only reproducing equipment. Schlesinger claims that the validity of the Ries patent in recording has been admitted collaterally and that he may institute suit on the recording process. Schlesinger points out that the Supreme Court has not passed on the Ries patent, having merely refused to review the Appellate Court decision upon motion of Western Electric attorneys.

## The Significance of Trade Unionism †

By SUMNER H. SLICHTER, Ph.D.

**S**TRIKES and revolts of workers are found far back in history, but only within the last two centuries, and especially within the last century, do we find wage earners maintaining more or less continuous organizations for the purpose of representing them in dealing with employers. Trade unions are just as much a distinctive feature of modern economic society as the corporation or the trade association. All over the world—in Mexico, Australia, South Africa, China, India, as well as in Europe and the United States—we find them. Of the 70 separate countries in the world, associations of wage earners have obtained some importance in over 50, and great importance in over 20.

Since 1897, the number of trade unionists in the United States has increased from 450,000 to approximately 3,900,000, or 14 per cent of the non-agricultural wage earners. The degree of organization is, of course, much greater in some branches of industry than in others. In building construction, over two-thirds of the workers are organized; in manufacturing, about 10 per cent; in mining, about one-third; in the transportation and public utility industries, somewhat more than one-third.

### Philosophic Background

To the man in the street, the principal function of unions are to raise wages and reduce the working day. But this conception misses the main significance of labor organizations. Primarily they are significant because of their relationship to the government of industry. In the early middle ages, sovereignty and property were not separated—the ownership of land carried with it many powers that

have since become functions of the state. The gigantic units of modern industry appear to be bringing about a reversion to the days when the sovereignty was an attribute of property.

With the ownership of property now goes the power to prescribe rules which affect employees as intimately as do the ordinances of the city in which they live, rules which prescribe when work shall begin, how long the men shall have for lunch, when work shall cease, for what reasons and how long employees may absent themselves without losing their jobs, whether payment shall be by the day or by the piece, by whom and for what reasons a man may be discharged, how promotions and lay-offs shall be made. Modern business enterprises, unlike feudal lords, do not have their own courts, but in their control over discharge they have a rough equivalent.

### The Unions' Goal

Wage earners have sought, through the organization of trade unions, to resist the tendency of property to acquire sovereign or quasi-sovereign powers. Wherever trade unions have sprung up, they have sought to make shop rules a matter of joint determination and their administration a matter of joint control. In other words, in the place of despotism under which the word of the manager is final, unionism seeks to introduce the principle that decisions should be based upon rules and that rules should be based upon the consent of the governed.

Undoubtedly the greatest objection to labor organizations on the part of management is that they interfere with efficiency. To this objection there are several answers. One is that there are other things which are no less important than efficiency. Among

them are security and liberty. Indeed, in view of the rapid rate at which we have been increasing per capita productivity during the last hundred years and our failure to make progress in the achievement of security, it is reasonable to conclude that security today is far more important than efficiency. We could well afford to exchange some of our efficiency for more security. And the same holds true for liberty.

### Security Invaluable

Whether or not trade unions interfere with efficiency, they are the only means by which the workman in the vast enterprises of modern industry can acquire liberty and security. They are the only way in which he can effectively bargain over whether he shall work six days a week or five, or whether he shall be paid by the piece or by the hour, over whether a change in conditions warrants a change in his piece rate. Likewise they are the only means through which the workman can acquire security, through which he can prevent the management from discharging him whenever it wishes.

To a substantial extent, security and labor go together, for liberty is partly a result of security. Only when men are protected against arbitrary discharge, dare they to express their aspirations, ideas, and grievances without dread of being heard by the foreman. Only through security do they acquire opportunity to criticize the management, to find fault with the way the plant is run, to talk freely about how they think it should be run—in other words, to express the same sort of ideas about the management of the plant that free citizens are accustomed to express about the government of the country. If these things interfere with production, the answer must be that they are well worth the cost.

### Human Values Upheld

The assertion that trade unions are indifferent or hostile to efficiency, raises the question: "What is efficiency?" We are accustomed to thinking of it in terms of money cost. That method of production most efficient which yields a given output with the least expenditure of dollars; that enterprise is most efficient which has the lowest money costs. Trade unions are just as much interested in decreasing the costs of production as are managements, but the costs which trade unions seek to reduce are the human rather than the money costs—the fatigue, the monotony, the injuries, the occupational diseases which are part of the cost of production. In other words, trade unions are just as much interested in efficiency as are employers, but they measure it by a

†From *Harvard Business School Alumni Bulletin*, May 15, 1931. Reprinted by special arrangement.



different test, by human costs rather than by money costs.

From the standpoint of the community, neither the wage earner's nor the business man's conception of industrial efficiency is satisfactory. From the community's standpoint, efficiency must include both low money costs and low human costs of production. At the present time, managers struggle hard to keep down money costs because they know that, if they fail, new managers will be hired. But there are no elaborate accounting systems and no expensive personnel for keeping track of human costs and, when these increase, the department heads are not called into the front office to explain. Real managerial efficiency will not be secured until management has just as strong an incentive to reduce human costs as it now has to reduce money costs. Here we see the need for strong labor organizations. Where labor is not organized, there is no one to hold management to account when human costs are unnecessarily high.

Much of the management which today passes for efficient is not really such, because it achieves low money costs at the expense of high human costs. Real efficiency will not be obtained until there are labor organizations which can compel executives to watch human costs just as closely and carefully as stockholders now compel them to watch money costs. This is why it is highly probable that widespread organization of labor would promote, instead of injure, real industrial efficiency.

#### Unionism An Asset

Although the employers of the country do not have the power to prevent the spread of trade unionism, they do have the power to determine, within broad limits, the kind of trade unionism which develops. By resisting every effort of workers to organize, by compelling unions to fight long and hard merely for recognition, employers can create a trade unionism which is narrow, bitter, irresponsible, which does not understand the problems of the employer and which is not interested in understanding them. On the other hand, by meeting trade unions half way, by permitting employees to organize, and by seeking the goodwill and the cooperation of their organizations, employers can help build a labor movement which has a broad social vision, which appreciates the fact that wage earners as much as employers are interested in the prosperity of the industry, and which is ready to help employers in solving problems of production.

Mr. Daniel Willard, Sir Henry Thornton, Mr. F. W. Sargent, Mr. H. A. Scandrett, and many other executives have shown that good management can make trade unionism an asset for the employer as well as for

the wage earner. A large number of labor unions—the machinists' union, the electricians', the sheet metal workers', the boilermakers', the blacksmiths', the carmen's, the maintenance-of-way men's, the printing pressmen's, the photo-engravers', the textile workers', and the clothing workers'—have demonstrated not only their willingness to cooperate with management in solving problems of plant operation, but their ability to make an important contribution. Needless to say, these organizations are not willing to cooperate on any terms and conditions. Naturally and properly they put the interests of their members ahead of the interests of the stockholders for whom they work. The fact remains, however, that ingenious and far-sighted leaders on both sides who possess the will to cooperate have succeeded in discovering a basis on which management and

labor can join to promote the interests which they have in common.

Whether or not the dominant note in American industrial relations during the next generation will be union-management cooperation or bitter class struggle depends upon whether the leaders in the industries which are now unorganized—iron and steel, automobile, electrical equipment, meat packing, rubber, telephone, petroleum, agricultural implements, and others—persist in their uncompromising opposition to the efforts of wage earners to join the other organized groups in the community. My prediction is that the policy of union-management cooperation will prevail, because I am confident that there is enough industrial statesmanship among American business men for them to realize that the policy of suppressing organization is the policy of sitting on the safety valve.

## Patents:

*A series of instructive and interesting articles on how patents are obtained and sold.*

By **RAY B. WHITMAN**

*Note: In this series of articles Mr. Ray B. Whitman, practicing patent attorney of New York City, explains in understandable non-technical language, just what a patent is, how one is secured, and how it may be sold. In addition, Mr. Whitman offers to the readers of this magazine personal advice without obligation on any subject connected with patents, trade marks, designs, or copyrights. All inquiries should be addressed to Mr. Whitman in care of this magazine.—EDITOR.*

#### The Ideal Attorney

**T**HE ideal patent attorney is one who not only has a thorough knowledge of patent law and procedure, and especially Patent Office practice, by virtue of a proper education and long experience in the work, but who is also a graduate engineer and with a successful experience in that profession. Such a man, whose mind is trained both logically and analytically, is best able to properly represent an inventor.

[The Patent Office, in fact, requires each of its Examiners, who examine all inventions before deciding to grant the patents, to be technical graduates, trained in scientific subjects. And the time is not far off when this same requirement will be made to apply to patent attorneys, for they are required to do not only everything the Examiner must do, but many things also which are far more technical. At present, however, any young law student who has completed a course of study in general law and been admitted to the bar, can present his certificate and become registered to practice as a full-fledged patent attorney.]

If the inventor does not know of a really able attorney with a record for taking out good patents, he should try to locate some inventor who has made a monetary success from his patents, and find out whom he employed. Where, however, this is impossible, then engage some well-known attorney who represents, or has represented, some large corporation—which would ordinarily be

proof of his ability—and who may be located in one of the large cities.

#### Check Past Work

Another test in determining a good patent attorney, and perhaps the best of all, since it is one that almost never fails, is to check up some past work of the attorney before you engage him. This may be done by asking the one who you may be considering hiring to loan you, say, eight or ten copies of patents, chosen at random, which he has prepared, as evidenced by his signature on their drawings. Then put these patents through the method of analysis explained later under the heading "How to Analyze the Real Protection in Your Patents." If the results show that the particular attorney's work is not considerably above the average, based upon this analysis, consult some one else, and repeat the test until you finally locate one whose work does measure up to these requirements.

Since your attorney's skill and knowledge of patenting is going to have much to do with your success with your inventions in future, you should leave nothing undone to get a very good one in the beginning; for having once found such a man, you will probably want to retain him on all such matters in the future, and this association will, as the years go by, become increasingly valuable, and you will learn more and more how to co-operate with him and he with you. It is by such co-ordination of effort between attorney and client that the best successes come.

Having once chosen your attorney, you should put your complete trust in him, and follow his advice, although there is no harm done in checking up his work from time to time to see that it is kept up to par.

If you will follow this careful and  
(Continued on page 34)



## New Equipment and Appliances

### White Safety Control

THE principal parts of the White Safety Control, Model SC101, consist of the main control box which houses the starting switch, vacuum pump, vacuum-electric switch and solenoid magnet, upper loop valve, lower loop valve, sound head valve, relay assembly, lifting rod assembly for fire shutter, and tubing from the several valves to the vacuum pump.

The vacuum pump is of the Chamber Crank train type, consisting of four blades of a special oil-impregnated wood operating in steel ways and maintaining a constant pull of vacuum through centrifugal force against the walls of the pump. This pump creates and maintains a vacuum of 4" of mercury at the standard speed of 90' per minute film projection. The electrical circuit is open until closed by the action of the vacuum-electric switch. The vacuum switch is constructed with a syphon bellows operating contact, movement of the bellows being accomplished through the medium of the vacuum developed by the vacuum pump.

The upper film contact valve is fastened by the two screws on the rear casing of the projector head, forming a shim under the valve. The upper film contact valve is composed of an apron curved in a manner similar to the upper film loop and is suspended about 1/2" above it. Any irregularity or upward movement of film loop will immediately operate by displacing this apron and releasing the vacuum. Suspended below the upper loop is an arm attached to the apron part of the valve which will release the vacuum should any irregularity or loss of loop in a downward manner occur as the film is passing through.

### Absolutely No Film Injury

The lower loop contact valve is fastened to the sleeve on the crank shaft of the projector and operates with a rotary motion from an arm with spring tension riding the film as it passes from the projector head. Lessening of the tension on the film or the breaking of the film at this point releases this arm and opens the valve. The movietone and sound head valve is fastened to a valve entering the lower magazine operating substantially in the manner of the lower loop switch on the tension of the film passing into the lower magazine. These two latter valve arms contain rollers that are finely machined and designed to ride only the sprocket hole parts of the film thereby insuring no injury to the photographic and sound section of the film.

The White Safety Control is de-

signed to operate first, cutting off the light through the medium of the fire shutter which travels 29/32" and operates in 1/16 of a second. The machine projection is immediately stopped because of the interruption of the electrical current before any possible damage can occur to either film or mechanism. It is also designed to detect any failing of the operator to properly thread the film in a regular manner in the projector. Should any irregularity of either film or mechanism occur, the device immediately checks it and will not permit operation of the projector until this irregularity is removed.

The White Safety Control immediately checks itself by refusing to operate the projector in the event of any accident or failure of its own mechanism which might cause a failure in its safety principle. The irregularities that will disturb the setting of the safety device and cause it to act are as follows:

### Actuating Causes

1. Any break in the film from any cause whatsoever.
2. When sprocket holes are torn or damaged on both sides of the film.
3. Any loss in regular loops of film.
4. Breaking or slipping, to a dangerous degree, of driving belts and chains.
5. Slowing down of the projector from any cause to a dangerous speed.
6. Any jamming of projector or sound mechanism.
7. Failure of take-up mechanism.
8. Improper or careless threading of film.
9. Power failure of the motor circuit.
10. Extreme drops in supply voltage.

Briefly, the cycle of operation of the White Safety Control is as follows: A momentary contact switch, mounted adjacent to the projector head, is depressed and, when sufficient speed is attained by the projector to create the vacuum necessary in the pump, the contact bellows contract thereby closing the electrical contacts and shunting the current through the relay around the momentary contact switch and energizing the solenoid magnet at the same time.

The magnet lifts the fire shutter, admitting the light for projection and maintains the operation of the projector until the hazard arises. The vacuum is released through one or several of the various valves or through the lessening of the vacuum in the pump, thereby causing the bellows to expand, de-energizing the solenoid magnet, causing the shutter to drop because of its spring tension, opening the electrical contact, at the same time causing an immediate stoppage of the projector mechanism.

### "Casco" Carbon Saver

A carbon saver which is warranted to burn both hi-low and high intensity. carbons down to at least two inches has been announced as ready for distribution by Carbon Saver Co., Inc., of 8 Beach Street, New York. Carbons ready for use with this "Casco" saver may be obtained from Carbon Products Co., Inc., at the same address.

The "Casco" Carbon Saver effects a great saving in carbon costs in the projection room, as it permits a burning of more of the carbon than heretofore. No preparation for the use of this saver is necessary, and the projectionist is not inconvenienced in any respect. The carbon saver consists of: a rod "E" (see accompanying sketch); and an extension "D." The extension "D" is inserted into the opening "C" provided in the carbon. "A" is the shell of the carbon, and "B" is the core.

### "Close" Burning Possible

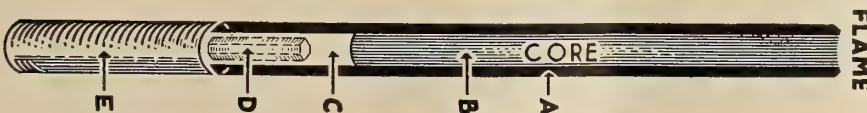
When the extension of the carbon saver is inserted into the carbon, there remains a free space of 1/2" between the extension and the core of the carbon. As the extension is 1" long, and the free space 1/2", the projectionist is enabled to burn the carbon down to 1 3/4", if desired, still leaving 3/4" of usable carbon. There is absolutely no risk in such "close" burning of the carbon.

The rod of the carbon saver is of the same diameter as the positive carbon, that is, 11 mm., 13.6 mm., and 16 mm. for high intensity; and 9 mm. for hi-low carbons. The saver assumes the function of the carbon itself, both in the turning gears and in the electrode. The carbon will burn with the same brilliance and steadiness even after it has left the electrode, as the current is transmitted by the carbon saver. To turn the carbon and the saver "backward" use handle, *without* releasing the jaw.

Further details regarding both the "Casco" carbon saver and the carbons which are used with the saver will gladly be supplied by the distributing company previously named.

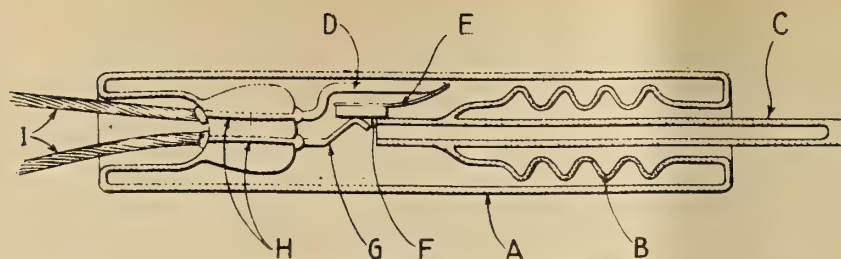
### The Burgess Vacuum Contact

The Burgess Vacuum Contact is a new and improved device for use wherever a positive, rapid and durable electrical contact is needed in circuits handling up to 6 amperes continuous load or 8 amperes intermittently, at potentials up to 220 volts. It can be operated by hand, by mechanical means, or again by electromagnetic agency in conjunction with the usual telephone type relay. This contact is especially well adapted for use in telegraph and telephone circuits, for railway switches and signals, for fire and burglar alarm systems, controllers, advertising signs, rectifiers, electric



Constructional details of the "Casco" Carbon Saver





Schematic of Burgess Vacuum Contact

ranges and other applications where a considerable wattage must be controlled by a minimum of energy.

The accompanying diagram presents the operating details of the vacuum contact. It will be noted that the principle is extremely simple. It makes use of the elastic property of glass to cause the mechanical actuation of contacts sealed in vacuum. The bellows *B*, because of their shape and the tempering of the glass, are highly elastic. A slight movement of the stem or protruding rod *C* is communicated to the movable contact block *E*, causing it to separate from contact block *G* which is stationary. The spring *F* makes positive contact between the contacts when no pressure is applied to the stem. The contacts are maintained in the evacuated glass tube *A*. The leads are indicated at *I*.

#### Operating Details

Operating in a vacuum, the vacuum contact is free from serious arcing and corroded contacts. It can handle its rated current as fast as 40 breaks per second. The make and break are positive and clean, without the hand-overs and chattering experienced with other forms of contacts, as proved by comparative oscillograph recordings. The vacuum contact requires a movement of only 0.02 inch at the end of its stem, which can be brought about by a force of less than 10 ounces, and usually but 6 ounces. The temperature rise at the rated current is extremely slight. The circuit is broken without arcing at less than 0.001 inch separation of the contact blocks. The small movement and slight force required for operation, lowers the total cost by the elimination of mechanical links. As for life, one of these contacts has been operated, at a rate of 10 times per second, 124,000-000 times, without breakdown.

The Burgess vacuum contact is conservatively rated to handle 6 amperes intermittently. The energy continuous load. It will handle 8 amperes intermittently. The energy controlled is therefore of the order of two horsepower, controlled by the slightest pressure on the glass stem. There is no spark or arc, although on inductive loads a condenser is shunted across the contact. This device represents an ideal means of breaking heavy A. C. or D. C. currents with safety, rapidity and small force.

#### Holds Much Promise

The normal action of the vacuum contact is with contact blocks in positive contact. A slight pressure on the stem breaks the circuit. However, this action can be reversed by mounting the contact with a pressure on the stem normally to break the

circuit. Releasing the pressure will cause the circuit to close. Either method of control is practical. The ideal method of operating the vacuum contact is by means of a single electromagnet relay or telephone type relay, the armature of which is coupled to the end of the vacuum contact stem. The vacuum contact is clamped to the relay by suitable means.

With the early availability of an entirely new form of light-sensitive cell, the vacuum contact promises to play an important role in the light control of many electrical circuits. The vacuum contact makes possible the operation of powerful equipment by means of light control, with an absolute minimum of equipment. The vacuum contact may be operated by a simple telephone-type relay operating in the plate circuit of an amplifying tube fed by the output of the light-sensitive cell circuit, or again by a sensitive polarized relay actuated by the cell and in turn controlling the telephone relay which operates the vacuum contact for controlling over 1,000 watts if necessary.

### The New Radiovisor Selenium Cell For Sound Pictures

In the past there were many attempts made to use selenium as the light sensitive agent in the reproduction of sound with motion pictures. These attempts have failed through a lack of knowledge of the properties of selenium and of the correct methods of preparing the light-sensitive variety. The principal troubles have been cell hiss, microphonics, lack of sensitivity, and an un-reproducible frequency response, besides being liable to failure from over-voltage.

Many years of research have been spent by the Radiovisor Companies of Great Britain on this application of selenium. Today as a result they are producing two types of cell, one for the reproducing of sound-on-film and any other acoustic work. The Radiovisor cells are constant and reliable and have an indefinite life. They are guaranteed unconditionally for a year. The frequency response is the same for all cells and the maximum difference in the output is only  $\pm 3$  db. Since the frequency response curve is an exact hyperbola for every cell it is easy to correct for this and correct it to any desired extent.

The cells have very low resistances so that by the use of low capacity cables the amplifiers may be placed some 15 feet from the cells. On account of this the head amplifiers are eliminated and the use of only one amplifier is required. The change-over is then effected by changing the whole amplifier from one cell to the other.

The cells are silent and non-microphonic in operation. They are rugged and robust in their simplicity of construction. Their sensitivity is such that they are 10-db better than the average photo-electric cell. As for voltage overload, the Radiovisor cells can withstand 800 volts and often 1,000 volts for short periods, though it is usual to run them between 100 volts and 200 volts. The output is proportional to the applied voltage.

There has also been designed a pre-amplifier and low capacity cable to work with the cells. This pre-amplifier corrects for the frequency response over a very much wider range than is recorded on film. In summary therefore it can be stated that the Radiovisor Acoustic Selenium Bridge is ideally fitted for high quality sound reproduction.

### New Asbestos Sound Screen

This new screen consists of a series of rod-like filaments, the shape and angles of each rod being based upon complicated mathematical formulae. Keasbey & Mattison Company of Ambler, Pa., one of the country's leading manufacturers of asbestos products, recently discovered a means of forming *asbestos* into rod-like threads which are woven together to produce a motion picture screen. This new screen is called "Visibestone," a combination of syllables abstracted from the words, vision, asbestos and tone. While it is not claimed that complete stereoscopic vision is thus obtained, it is claimed that, upon seeing a picture projected on this screen, a tremendous depth of picture is apparent. There are no harsh, glistening reflections; there are no holes to destroy the picture, but from each of these asbestos fibre rods the light is reflected brightly and smoothly, resulting in a perfection of contrasts and shading in the picture not obtainable upon a smooth surface of sheet, nor from one containing crystals or reflecting particles.

One of the serious handicaps to good projection in many theatres is the large number of seats at the side and near the front of the house, in which the picture is distorted or lacking in sufficient light to be easily seen. It is claimed that this new screen entirely overcomes this objection because of the rod-like structure, since light is reflected from the round surface of these rods into the remote angles of the theatre. Comparing a picture on this screen with a flat screen is said to approximate the difference between seeing with two eyes or one, or comparing a photograph with its newspaper reproduction.

#### Uniformly High Reflection

The scientific design of the ideal theoretical screen for relief picture projection depends upon the critical relationship between the shape of the rods and the refractive index of the material. Here again, in asbestos, nature has provided ideal material for this purpose. Each of these asbestos threads consists of a multitude of fine, glass-like fibres, which results in a



soft and even reflection of the light. Combined with these properties, a special surfacing material is employed which increases the normal light reflection value. As a result, scientific tests have shown a uniformly high light reflection from this screen at all angles at which it is possible to be viewed in a motion picture theatre. While such measurements are of value, they do not indicate the full degree of improvement gained by this rod-like construction in eliminating the distortion and giving a brilliant picture even at the extreme sides of a theatre.

The Visibestone Sound Screen, being an asbestos product, is obviously fireproof and non-combustible. It has been approved by Electrical Research Products, Inc., for use with talking picture equipment and is being distributed by National Theatre Supply Company.

### Fox Reproducing Unit

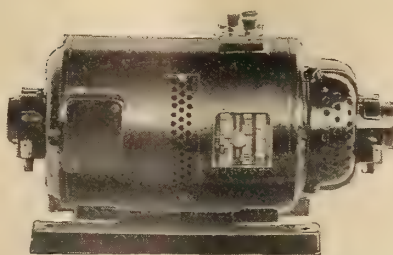
An electrodynamic unit which will faithfully reproduce both the oral and musical range in equally exact values has been designed by Fox Engineering Co. of Toledo, Ohio. This new Fox unit attains every range and volume required without distortion, making it an admirable unit for theatres, public address systems, and all sound reproducing purposes where quality, realism, and dependability of reproduction are prime requisites.

Tolerances as fine as .001 inch are maintained by the use of precision gauges in the hands of experienced inspectors, which insures uniform production and dependable performance. A minimum number of parts are used, which adds greatly to the simplicity of the unit. The unit can be quickly taken apart or assembled by means of one large master screw, and an interchangeable "voice coil cartridge" may easily be substituted, if necessary, thus eliminating any possibility of having to purchase an entire new unit. This Fox unit is not affected by climatic conditions.

The outer bowl of the unit is stamped from one piece of heavy special alloy. In this bowl rests the field coil for supplying the magnetic energy required. This exciting energy of 6 volts can be supplied either with an ordinary 6-volt storage battery or a specially designed rectifier which can be obtained from the Fox company. Full descriptive matter, including prices, will be mailed to any inquirer upon request to Fox Engineering Co., 386 Dorr St., Toledo, Ohio.

### New Motor Generator Line For Theatre Operation

Motor generators for replacing storage batteries in theatres have been developed by the Electric Specialty Company of Stamford, Conn. These machines supply low voltage, direct current for the fields of loudspeakers and for the exciter lamps of the sound equipment. They are very carefully designed so that they do not cause any objectionable background hum in the loudspeakers. A simple



An Electric Specialty generator

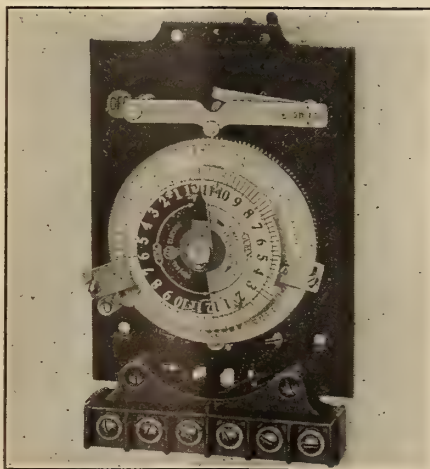
filter system is used when they supply power to the exciter lamps, but filters are not used with the horn fields. The machines are furnished complete with filters, when required, and they may be readily connected in place of the storage batteries.

These machines are of exceptionally rugged construction and are mechanically designed for the least possible amount of attention and maintenance expense. Wool-packed sleeve bearings are used, which require no attention, except very infrequent lubrication, and run very quietly. The machines are semi-enclosed, all live parts and rotating members being completely protected. Terminal boxes are provided for conduit connection.

Motor generators provide the most reliable source of power obtainable and are more economical in the long run than other forms of power supply apparatus.

### A "Thinking" Switch

TO duplicate the possibilities of a new type of time switch, a man would need an almanac, a knowledge of latitude and longitude, a precise watch, a degree of punctuality far above the average, and the ability to be awake and alert at all hours. The switch, a product of the General Electric Company, will turn lights on and off at dusk and at dawn, or at any predetermined time before or after sunrise and sunset; and will make due allowances for geographical latitude and for the season of the year. It can be made to take holidays, omitting its operations on any desired days of the week. It can perform such operations as starting motors in the morning, starting and stopping them throughout the day according to schedule and shutting



New G.E. time switch

them down at the end of the day. It will care for industrial heating problems, since by its use apparatus may be turned on early in the morning so as to be ready for the workmen when they arrive.

The new switch can do two things at once. In an apartment house, for instance, it can turn on the hall and fire lights at dusk, turn off the hall lights at midnight, and keep the fire lights on until dawn. In the home the switch replaces the "alarm clock" control that more than one ingenious jack-of-all-trades has contrived to turn on this or that before it is time to arise. Not all the above duties can be performed by the one switch, but various designs are available for such different tasks.

### Features of the Equipment

Three features of the new time switch, designated as GE Type T-13, are the use of the G. E. Telechron motor, as used in electric clocks, for timing the device; the employment of mercury-to-mercury Kon-nec-tor switches; and the availability of astronomic dials, corrected for latitude. It is designed for alternating-current circuits of 115 volts and 30 amperes or 230 volts and 15 amperes current-carrying capacity. It is available in single- or double-pole, both single- or double-throw, and with either a plain or an astronomic dial. Apartment-house lighting is cared for by still another model, the two-circuit form.

Two adjustable riders ("on" and "off") give two operations every 24 hours. Except in the cases of the astronomic and two-circuit types, additional riders may be installed to give practically any number of operations daily; and the addition of an omitting device permits one or more days to be skipped if desired. The housing is such that the time switch can be used for either indoor or outdoor service. The case measures 10 5/16" in height, 5 3/8" in width, and 5" in depth. The instrument weighs 6 1/2 pounds.

### Technical Bureau Served to Preserve M. P. Academy

A lesson in efficient organizing as well as the first rock-bottom exposition of the place occupied and the functions performed by the Academy of Motion Picture Arts and Sciences is embodied in the following editorial sent on to us by Rob Wagner editor of *Rob Wagner's Script*, a lively weekly published in Beverly Hills, California. Rob Wagner was one of the small group of "Hollywooden-heads," as he terms them, who refused to "play along" with the Academy program, and in the following interesting editorial entitled "We Eat Our Words" he cites the reasons for his change of heart on this matter:

Four years ago some two hundred "leaders of the motion picture industry" met for dinner in the Biltmore Gold Room for the purpose of forming an organization to be known as the Academy of Motion Picture Arts and Sciences. We were among the "leaders" who sat spellbound while Cecil de Mille, Conrad Nagel, Louiebee Mayer, and other Hot Shots told how the Academy was to be a meeting-



place of the Arts and Sciences, whereat the actors, directors, technicians, and producers would sit at a round table and discuss their mutual affairs. It all sounded perfectly grand and with splendid eloquence we were urged to "co-operate a hundred per cent" and "shove the new organization over with a bang." So well-programmed was the meeting that Mike Levee even had blank checks made out on every bank in town, so all we had to do was sign for a hundred bucks each and become Academicians.

The result was that two hundred and sixty out of two hundred and seventy-five happy banqueters signed up and the Academy of Motion Picture Arts and Sciences was an accomplished fact. We were one of the fifteen stubborn Hollywood heads who refused to program.

#### Flatter the Bellwether and the Herd Follows

The truth is we were one among many others suspicious of the whole darned thing. At that time there were all sorts of troubles brewing within the industry—the cinematographers were organizing to the hilt, the actors were chafing under intolerable conditions, and the writers who heretofore had been merely a lot of white rabbits too frightened to organize, taking anything that was handed to them, had begun to wake up to their powers. So it seemed to many of us that the Academy was merely a pretty invention of the producers to get the leaders of the various studios into a little group that could be "handled" and through these leaders to keep the rank and file of the studio workers in line. We even thought that the very grandiose title—"The Academy of Motion Picture Arts and Sciences"—was the perfume to the economic chloroform that the producers were to administer in the name of Art and Science. After its four years of work we have outgrown this suspicion.

#### Science Saves the Academy

It was the Technicians' Branch that saved the Academy from becoming merely a conciliation committee between a lot of hard-boiled producer-employers and a bigger lot of foolish artist-employees. Sound pictures were born almost at the moment of the Academy's birth and with sound came an amazing set of new problems that had to be met instantly. And as might be expected each studio was meeting its own problems in its own selfish way. Collier's wanted us to do a story about the new "talkies" and well do we remember with what mystery each lot was enveloped. Guards were stationed at the stage entrances, crews took horrid oaths of secrecy, scouts were planted in rival studios, and workers were bribed.

Here, indeed, was a real job for the Academy and it is to the credit of Irving Thalberg, the producers' representative at the meeting with the Technicians' Branch, that the Academy kicked all the mystery and secrecy out of the window by bringing the technicians of every studio together to lay all their cards on the table.

#### Pure Science Bests Quackery

What was the best camera silencer? One studio used booths or "igloos"; another simply hung blankets over the camera; one developed "blimps"; another "bungalows", and so forth. The Academy ordered every device to be tried out in an experimental laboratory and found that "a laminated structure seems to be better than a homogenous side wall, whether the latter be rigid or elastic." "Arc hiss" and "incandescent crackling" were solved by certain technicians and the solution made accessible to all. In fact, the problems of sound were attacked by the combined scientific research of all the studios working with the telephone and electrical companies for the general enlightenment of the whole industry.

Not only that, but by standardizing equipment and training the projectionists of the thousands of theatres in the use of new devices and getting them to accept the new standard release print, the studios have not only saved millions of dollars but their pictures are assured better projection.

(EDITOR'S NOTE: It might be well to note here that there was no "training of projectionists and getting them to accept the S. R. P." The adoption of the S. R. P. came about as the result of contact by the Academy with projectionist leaders who in turn contacted the projectionists. The latter accepted the S. R. P. on the say-so of their leaders—and without any training.)

#### Happiness in an Apparently Hopeless Marriage

We have said that we thought the original intention of the producers in the Academy was entirely autocratic and selfish, in that they could "handle" labor problems more easily if they could flatter the leaders and keep them "good." Curiously enough, however, their experience with the technicians has shown them a great light. We learn that in



Charles F. Eichhorn

### T.M.A. 23rd Convention Names Eichhorn Grand President

The twenty-third biennial convention of the Theatrical Mutual Association of the United States and Canada was held at the Hotel New Yorker, New York, July 6th to 9th. This convention was among the most successful ever sponsored by the T. M. A. with a vast amount of work being accomplished. Plans for strengthening the T. M. A. and expanding the scope of its influence were drafted, and the closing session marked the completion of many tasks of vital importance to the welfare of the organization.

On the first day the Convention was addressed by Peter Brady, president of The Federation Bank, largest labor bank in the world; on the second day by P. A. McGuire, advertising manager of International Projector Corp.; and on the closing day by William F. Canavan, president of the International Alliance.

Of particular interest to projectionists was the election as President of the Grand Lodge of Charles F. Eichhorn, vice-president of Local Union 306, M. P. M. O. U. of New York City. Eichhorn, a member of Long Island Lodge No. 67, first became identified with the T. M. A. in 1924 as an organizer in the Long Island

territory. From this time on his advancement within the T. M. A. was rapid, and he has held successively all offices from Fifth Grand Vice-President upward. His election as President of the Grand Lodge climaxes a record of splendid service for the T. M. A.

"The Theatrical Mutual Association is a powerful agency for good in its field," said Eichhorn in commenting on his election to the presidency of the organization. "Good as has been its influence in the past, the newly-elected officers are determined to greatly enlarge the scope of the work being done by the T. M. A. and to round out an organization which will render a genuine service to its members. To this end a greatly increased membership is desired, and all members of the amusement field are looked to for cooperation with the T. M. A. We have laid out a rather ambitious schedule for the coming year, amusement field workers can help to make our task just so much easier by extending to us their goodwill and cooperation."

In addition to his Local Union duties, Eichhorn also takes an active part in all efforts for progress within the projectionist craft. He is a regional vice-president of the Projection Advisory Council for the New York territory.

### Machines and Happiness

In a symposium on the engineer's contribution to happiness, arranged by the Engineering Foundation, Dr. C. Kenneth Mees makes the point that synthetic chemistry, machinery and push-button conveniences may make us more comfortable but do not make life more satisfying or joyous than it was in ancient times. He even believes that he would have been as happy in Nineveh with oil-lamps and ox-carts as he is now with electric lights and trolley cars. Thus he strikes a discordant note in a series of articles by technologists who are highly content with the machine age.

As he casts about for evidence of a really substantial contribution by science and engineering to human happiness, Dr. Mees finds but one—the bacteriologist and the engineer have controlled disease. Another aid to happiness might well have been added. Famine has ceased to be the menace that it was. The world was never so thickly populated as it is now. Without the chemist's aid, canning and cold storage, without the invention of labor-saving agricultural machines, most of the children that are now saved by scientific care and many of the adults who manage to hold their own in the economic struggle would perish. If health and the assurance of the next meal are conducive to happiness, our "materialism" has a certain defense.

their first meetings with the sound fellows they were arrogant and opinionated; but when they learned that the technicians knew their stuff and that they, the producers, knew nothing about the technical problems, they at first became tolerant and then humble.

And it is this spirit, taught to them by men who were supreme in their own field, that has made them amenable to the problems of the artists in motion pictures, with the result that the standard contract for actors is now an assured success and even the writers are at last to meet with their "ancient enemies," no doubt to emerge with a status agreeable to both employer and employee. Thus there is no doubt that the Academy of Motion Picture Arts & Sciences has become a wonderful institution which should be supported by everybody connected with the industry. And this from one who is compelled to eat his words and his humblest suspicions.



## Everyday Science

### Electrical Analysis of Blood

The accuracy of blood and other physiological analyses which often depends upon the accuracy of color observation on the part of the analyst, has been enhanced by the development of an electric eye which can be carefully calibrated in reference to sensitivity to different colors. The Arc-turus Radio Tube Company, Newark, N. J., manufacturers of the electric eye, describes this photo-electric principle as an aid in such work.

"The human eye," the statement says, "almost invariably suffers to an extent from color blindness. Some persons are more color blind than others, and most of us will find that one eye sees objects with a slightly different shade than the other. This can be noticed by looking at a highly colored picture first with one eye and then with the other. When it comes to blood and other physiological analyses, where color is often a determining factor, an electric eye, such as the photo-electric cell, which never suffers from color blindness, or even retinal fatigue (which may affect even the normal eye), is a considerable contribution to the accuracy of results.

"The photo-electric eye can detect color differences beyond the sensitivity of the best human eye, and can relay its decision to amplifying apparatus that will indicate the color or variation from a standard color on a printed chart for a permanent and accurate record. This scientific development is an invaluable contribution to the medical profession and should abet the high peak of efficiency for which physicians are striving."

### New Color Piano Enables Deaf to "See" Sounds

To the end that the totally deaf may share in the world's greatest pleasure—music—there has been developed a piano which translates sound into light so that with a bit of training, the deaf may "hear" through the "seeing" of different light shades, according to an item published recently in the news service sponsored by the Society for Electrical Development, Inc.

The device consists of a panel of colored light bulbs which may be attached to any piano at will. Each note on the keyboard has its corresponding colored bulb, which lights as the key is depressed. The color scheme may be changed to suit the player. In a recent demonstration by the inventor the green stood for C, orange for D, red for E, blue for F,

green for G, red for A and orange for B. This scheme would seem to lack subtlety, but no doubt varying shades of the same color will be developed. Mirrors placed so as to reflect the lights made them visible both to the pianist and to the audience.

Incidentally, the mechanism betrays with merciless candor any weakness in the technique of the player, and it ought to be a help in correcting inequalities in finger strength.

### A Decade or So of Radio

The number of homes in the United States in which telephones are installed is approximately 13,500,000. The number of homes in the United States which are wired for electricity is approximately 20,000,000. The number of homes in the United States now equipped with radio sets is estimated to be between 14,000,000 and 15,000,000.

It took 53 years since the beginning of telephone service to equip these homes with telephones. It took 49 years since the beginning of the electric power industry to equip these homes with electricity. It took 10 years since the beginning of the radio broadcast art to equip these homes with radio sets.

### Radio Causes Silkworms to Spin Much More Silk

Even silkworms work better to radio. Waves to make such worms spin more silk have been found successful by two Italian biologists, Signors G. Mezzadroli and E. Varenton. The waves were not those used in broadcasting but the so-called ultra-short waves between two and

three meters long, like the waves used recently by scientists of the General Electric Company to create fever in the bodies of men and animals.

Taking a batch of silkworms fifteen days after hatching from the egg, the Italian experimenters exposed these worms for 30 minutes each day to the radiation from a powerful generator of these ultra-short waves. Exactly similar worms hatched at the same time and fed with the same food were kept as a standard for comparison. The radiated worms grew faster, both in length and weight, it was found, than did the worms which had no radio. Also, the radio worms began to spin their silken cocoons sooner and produced an appreciably higher average of silk.

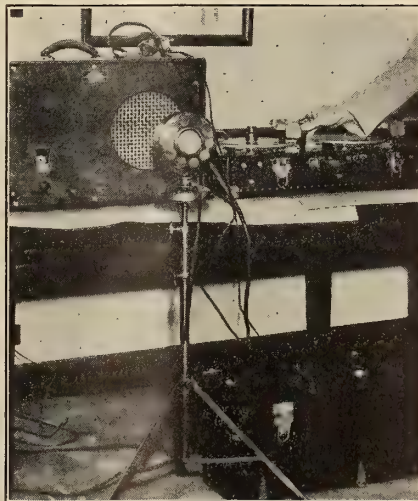
Every feature of the experiment indicates, the two biologists reported recently, that the radio treatment quickened the life cycle of the worms so that more silk could be produced in less time and on smaller quantities of the mulberry leaves which silkworms use for food. Probably the radio waves act chiefly by heating the worms just as similar waves cause slight fever in other animals. Whether the experiment will lead to practical trials of short-wave radio to speed up silkworm farming is doubtful because of the cost.

### U.S. Leads in Use of Electricity

One well informed authority on world development of electric light and power estimates the production of electricity throughout the world to be in the vicinity of 300,000,000,000 kilowatt hours per year, and that the United States produces approximately 41 per cent of the total. This is somewhat lower than previous estimates, which have placed the use of electricity in the United States at approximately one-half the total for the whole world. These figures, however, are based upon the output of public utility plants contributing to the public supply, operated by private, municipal or governmental agencies, and does not take into account a very large amount of electricity which is generated by manufacturers and others for their own use.

### Projector Oil Shield

H. L. Newton, projectionist at the Orpheum Theatre in Neosho, Mo., is marketing a new oil shield for projectors that is said to be very light and inexpensive. The device fits the head of any Simplex projector using the Western Electric universal base, and is said to keep the oil from dripping into the delicate parts of the sound apparatus.



New RCA equipment which is used to record radio broadcasts



## A Program Is Only As Good As It Is Projected

Today's critical  
audiences demand faultless  
projection



HIGH INTENSITY AUTOMATIC  
REFLECTOR ARC LAMPS

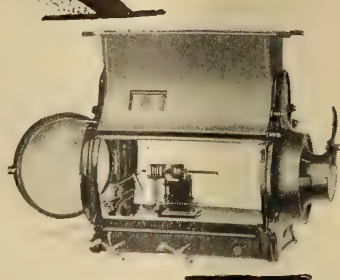
Buy only that equipment which incorporates all  
up-to-the-minute improvements.

For Sale By Independent Supply Dealers

### The Strong Electric Corporation

2501 Lagrange St., Toledo, Ohio

Export Offices: 44 Whitehall St., New York, N. Y.



## BEST CARBON SAVER FOR LOW INTENSITY LAMPS



Saves jaws of Lamp as well as Carbon. Made in all sizes.

\$2.50 each at your dealer.

### BEST DEVICES CO.

200 FILM BUILDING

CLEVELAND, OHIO

## How To Get a Patent

(Continued from page 28)

painstaking method of choosing and retaining your attorney, you will be saved many of the most serious pitfalls which beset the inventor, such for instance as serious loss of your rights due to the attorney's inability to properly understand or claim your invention, necessitating additional expense of reissuing the patent to correct it, and even, in many instances, inability to do so, after the time has expired; or, loss of a profitable sale or license through not having an attorney who is well regarded by the prospective purchaser.

### The Patentability Search

Although, as the next step, it is usually desirable to have your attorney immediately prepare and file your application for patent on your invention, it sometimes save expense to instruct him to have a thorough search made through all the issued patents in the class of your invention, to determine its extent of patentability. For you are entitled to a patent only on what is really new. And it is often amazing how much is old among patents that is yet apparently novel because never put on the market.

The cost of such a preliminary patentability search is usually from ten to twenty-five dollars. It is never quite complete, since it does not include (because too costly), a search among foreign patents, which may also be cited by the Examiner against the allowance of a patent. Neither does it include pending applications, which are always retained in secrecy, and are only examinable after your application has been filed, and then only by the Examiner in his final search for prospective interferences.

Notwithstanding, a patentability search conscientiously made and reported to the inventor by a reputable attorney, will, in most cases where little or no patent protection of value is possible, bring that fact out, and so save the inventor the needless greater expense of filing the application for patent. In such instances, the attorney will explain in detail the nature of the prior patents found, and just why and to what extent they will limit you in getting a good patent, so you can decide for yourself whether or not you want to proceed, in spite of such prior art.

### Even Weak Patents Are Sometimes Profitable

It is sometimes wise to take out a patent, even if you know it's going to be a weak one; since any patent may be said to have, besides its real or protective value, also both an advertising value, and a restraining value. Its advertising value is its effect, from an advertising viewpoint, on the public mind, which dignifies and elevates the importance of an invention which is patented, by virtue of its having passed a certain government test, the exact nature of which is little known to the public, and its value often overestimated. And its restraining value is the presumption of validity and



strength assumed to be in every issued patent, rightfully or wrongfully, by this same unlearned public.

For if a patent, no matter how weak, frightens a competitor from infringing it because of its weakness, it accomplishes the same purpose in that instance as though strong enough to stand up in a court contest. In fact, it is astonishing how often shrewd business men will contract to pay for the rights under patents which are of so little value as to be easily avoided, and so open to public use without charge.

#### Avoid Misunderstandings

If the preliminary search reveals nothing published like your invention, or if for some such other reason as the above you decide to file an application, you should next have a clear understanding with the attorney as to the cost of doing the work. It will be fair to both of you if he sets a definite sum merely to prepare and file the application (because he can gauge that far the extent of his service needed), and an additional sum for each amendment which it may later be necessary to prepare during the prosecution of the application into a patent. In this way, you have the ultimate cost largely in your own hands, and you prevent him from charging a too high fee for contingencies which may not happen in your case.

(To be continued)

### Lewis Milestone Wins Award in 10-Best Directors Poll

For his direction of "All Quiet on the Western Front" and "The Front Page," Lewis Milestone walked away with first place in *The Film Daily* poll for the Ten Best Directors of 1930-31. Milestone received votes from 252 out of approximately 300 leading motion picture critics who participated in the balloting.

Next after Milestone came Wesley Ruggles, with 179 votes, followed by George Hill, 160; Josef von Sternberg, 148; D. W. Griffith, 139; Robert Z. Leonard, 137; John Cromwell, 111; Charles Chaplin, 101; Howard Hawks, 101; Howard Hughes, 91.

Milestone's achievement is particu-

larly notable in that the two productions he directed were vastly different in origin and design, in addition to being produced on different lots. "All Quiet," a Universal picture, was adapted from the war novel by Erich Maria Remarque, while "The Front Page" came from the stage hit of the same name and was made under the Howard Hughes banner for United Artists release.

Complete list of pictures directed by the Ten Best of 1930-31 follows:

Lewis Milestone—All Quiet on the Western Front, Front Page.

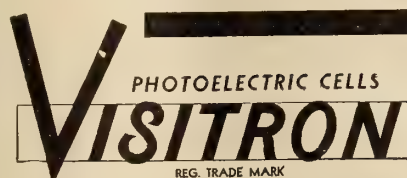
Wesley Ruggles—The Sea Bat, Cimarron.

George Hill—The Big House, Min and Bill.

Josef von Sternberg—The Blue Angel, Morocco.

D. W. Griffith—Abraham Lincoln.

Robert Z. Leonard—The Divorcee, In



Afford  
Higher  
Sensitivity

Longer Life

Clearer  
Reproduction

Less  
Background  
Noise

Freedom  
from Trouble



Sold and guaranteed by National Theatre Supply Company — all branches



G-M LABORATORIES INC

1733 BELMONT AVE. CHICAGO, ILL.

**THEATRE EQUIPMENT**  
NEW AND USED

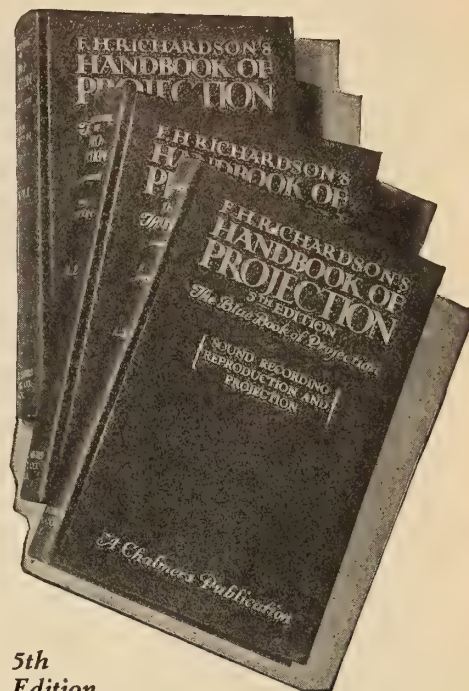
Sound Equipment, Moving Picture Machines, Screens, Booths, Opera Chairs, Spotlights, Stereopticons, Film Cabinets, Portable Projectors, M. P. Cameras, Generator Sets, Reflecting Arc Lamps, Carbons, Tickets, Mazda Lamps and Supplies.

Projection Machines repaired and overhauled. Repair parts for all makes opera chairs. Attractive 3x10 ft. muslin banners, \$1.50; on paper, 50 cents. We Pay Highest Prices for Used Projection Machines, Opera Chairs, etc.

Everything for the Theatre—Write for Catalog K.

MOVIE SUPPLY CO., 844 So. Wabash, Chicago.

## THE BEST SELLER



5th  
Edition

### HANDBOOK OF PROJECTION

By F. H. Richardson

Back in 1910 Mr. Richardson wrote the first Handbook of Projection. It was a sell out. Second, third and fourth editions, each bigger and more successful have followed. The present fifth edition in three separate volumes, illustrated above, is the culmination of years of intensive effort.

Richardson is no swivel chair author. He knows the problems of the field—meets the men on their own ground. His books reflect a practical knowledge of just what information is needed. Recently he completed a 17,000 mile trip through the U. S. and Canada in the interests of projection.

#### CONTENTS

Volumes I and II are devoted entirely to the general subject of projection and everything related to it. Volume III deals exclusively with sound projection. All three volumes are profusely illustrated and contain over 1,400 pages of projection information written so you can understand it clearly. Each volume contains Richardson's famous question and answer index giving immediate access to hundreds of different problems.

These are the books which are being used by projectionists and theatre managers all over the world to secure improved results. Send for this finest of projection libraries today.

#### USE COUPON TO ORDER

CHALMERS PUB. CO. (M)  
516 Fifth Avenue, New York, N. Y.

Enclosed find (check) (money order) for \$10.25. Send Richardson's 3 volume Handbook of Projection to.....

#### WINNIPEG, CANADA

J. M. RICE & CO., J. M. Rice, Prop. Leading equipment dealers in all kinds of projection room equipment facilities. Representatives of leading equipment manufacturers of the United States and Canada. All our merchandise guaranteed for performance and stability. Whatever you want we will supply it.

## THE BIOSCOPE

The Leading Journal of the  
British Cinematograph Industry

20th Year of Weekly Publication

Contains a complete section each week for the special benefit of Projectionists.

Cash prizes awarded for original ideas published. Specimen copies 18 cents.

Annual Subscription 7 dollars 50

THE BIOSCOPE PUBLISHING CO., Ltd.  
8-10 Charing Cross Road,  
London, W. C. Eng.



## Here's News!

### SYNCROFILM MODEL "J" SOUND HEAD



Model "J" sound heads are designed and built to comply with the requirements of the very small theatres, where low cost equipment is desirable.

Weber's Model "J" Syncrofilm sound heads are simple, sturdy, economical, and dependable, and are sold on the same guarantee basis as is the well-known standard Syncrofilm.

Two sound heads complete with photo cells, optical units, exciter lamps, high grade silent drives, and necessary attachments for projectors.

**\$275.00 per pair**

*Price and Particulars on request.*

## WEBER MACHINE CORP.

59 RUTTER ST., ROCHESTER, N. Y.

Export Dept., 15 Laight St., N. Y. C. Cable, "Ariab," New York

Gay Madrid, Let Us Be Gay, Bachelor Father, It's A Wise Child.  
*John Cromwell*—The Big Pond, For the Defense, Tom Sawyer, Scandal Sheet, Unfaithful.  
*Charles Chaplin*—City Lights.  
*Howard Hawks*—The Criminal Code, The Dawn Patrol.  
*Howard Hughes*—Hell's Angels.

### Detroit or N. Y. for S.M.P.E. Meet

Ballots have been sent to members of the Society of Motion Picture Engineers for a vote on the location of the Fall meeting. The board of governors have selected New York and Detroit for the choice of cities and the tentative date for the Fall meeting has been set for October 19 to 22 inclusive.

### Film Technical Progress

*(Continued from page 15)*

ducing ground noise to a minimum. Lichte has discussed in a general way the problems of sound recording associated with German equipment, laying particular stress on the underlying causes of distortion. Dreher has reviewed recent progress in sound recording both by variable density and variable width processes.

A most significant improvement in the quality of sound reproduced from variable density records has resulted from the introduction of the biased-valve method of recording by Western Electric. By this method, ground noise has been reduced 10 db., according to Silent. An auxiliary circuit is associated with the light valve, and when the sound currents are small, the ribbons vibrate over a small amplitude. As the sound increases, the spacing between the ribbons is increased automatically by the auxiliary circuit. Thus, the sound print is darker for weak sounds and lighter for strong sounds. About forty features had been produced up to April, 1931, using this method of recording. Full benefit of the system can be derived only by proper development of the sound track and close cooperation is therefore necessary between the sound department and the processing laboratory. The introduction of improved methods of recording has raised the question of reducing noises in theatres emanating from fans, ventilators, and projectors, and consideration is being given this question.

Another method of reducing ground noise is described by Townsend, Clark, and McDowell for use in variable width recording. A shutter in the path of the light beam is automatically moved to cut off as much light as possible, consistent with carrying the modulation. In principle, this scheme, like the Western Electric "Noiseless Recording" process, consists in rectifying a portion of the output of the recording amplifier, and using this current to keep the amount of light admitted to the film at a minimum.

According to reports from the West Coast studios, the practice of recording by electrical means is in-

# SOUND REELS

For Perfect Projection

**ALL-WELDED TYPE**  
One Unit

**LASTING DURABILITY**  
Bright Cadmium Plated

**UNIVERSAL ELECTRIC**  
9-16 Thirty-seventh Ave.,

—All Sizes—

**DEMOUNTABLE TYPE**  
Each side one unit

**ALL PARTS  
REPLACEABLE**

Write for quotations

**WELDING COMPANY**  
Long Island City, N. Y.

**Give This to Your Friend—Have Him Fill It in and Mail to us at Once**

The Motion Picture Projectionist  
 45 West 45th Street, New York City

Gentlemen:

Enclosed please find \$2.00 for which enter my subscription for one year (12 issues) starting with.....issue. (Two years, \$3.00.)

Name .....

Street ..... State.....

City..... Local No.....



creasing and the present tendency is to incorporate sound effects into the original sound track after it has been recorded and developed. It is often possible by this method to shoot scenes without sound equipment and add the sound effects later in the dubbing process. Loss of quality in re-recording which may be partly attributed to defects in dubbing machines has been greatly reduced by improvements in such apparatus.

As was foreseen, film recording is tending to replace disk recording, because of the greater ease of editing sound records on film and the introduction of methods of reducing ground noise, whereas disk recording affords little opportunity for further reduction in surface noise. All the major producing companies in the United States now appear to be making their original recordings on film. Re-recording is done when disks are required for release.

#### Editing, Splicing, and Tilting

A growing demand exists for the inspection of every release print regarding its sound and picture quality. One type of film inspection equipment consists of a standard Western Electric reproducer installed on a projector. The lower magazine is cut away to allow the film to be pulled back for hand inspection. Sound is picked up by a caesium cell and fed into an amplifier having an output ample for headset monitoring; with additional amplification, standard theatre horns may be used. A sound head made by Vinten is being used in England for examining the quality of release prints. In the Universal Laboratory, Hollywood, a final description of each release print is prepared by a stenographer who types the titles and identity of the successive scenes as the picture is projected on a small glass screen before her desk.

#### Cleaning, Reclaiming, and Storage

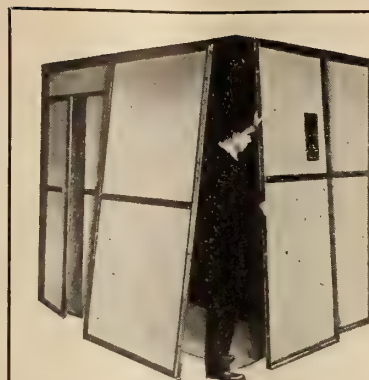
Changes in the design of a well-known buffing machine for cleaning film have been described by Dworsky. Patents issued include methods of waxing, humidification, surface protection, and elimination of scratches and abrasions on motion picture film.

#### Print Distribution

According to the Annual Report of the Academy of Motion Picture Arts and Sciences prints released during 1931 by practically all of the Hollywood studios will be prepared according to uniform specifications designed to facilitate threading, precision change-over, and exact synchronization.

#### Projection Equipment and Practice

Practically an instantaneous change of lenses was stated to be possible with a new front plate assembly for the Powers projector. Other modifications are a lens centering device, a micrometer focusing pinion, a framing lamp, and an aperture change assembly. According to an announcement in the German publication, *Die Kinotechnik*, the shutter on the Bauer



Both portable and, permanent type

#### STANDARD SIZES

4 ft. x 6 ft. x 7 ft. 1½ in. high  
6 ft. x 8 ft. x 7 ft. 1½ in. high  
8 ft. x 9 ft. x 7 ft. 1½ in. high  
9 ft. x 12 ft. x 7 ft. 1½ in. high  
9 ft. x 14 ft. x 7 ft. 1½ in. high

## PORTABLE AND PERMANENT FIRE-PROOF PROJECTION ROOMS

THESE booths are made of ¼" thick transite with angle iron 1¼" x 1¼" x 3/16". The panels are interchangeable and bolted together with stove bolts. The seams are filled with transite cement. The floor sheets are ⅜" thick asbestos. The Underwriters throughout the country have approved these booths, as well as the fire and building departments of all cities. Special booths built to conform with the Rules and Regulations of the Steamship Inspection Service on United States Shipping Lines.

## BLUE SEAL PRODUCTS COMPANY, Inc.

Distributor for Johns-Mansville Asbestos Products. Also  
Manufacturer of Motion Picture Accessories since 1913

WRITE FOR CATALOG OF BLUE SEAL PRODUCTS

262 Wyckoff Street

Brooklyn, N. Y.

M-7 projector is now arranged in front of the condenser lens in accordance with recent projector construction practice. Descriptions of the Hahn II, Ernemann II, and Ernemann III projectors, all of German manufacture, have been published. The last-named projector has a lens mount capable of carrying lenses of 80 and 100 mm. diameter, thus permitting an aperture of  $f/1.9$  to be used on lenses of almost any focal length.

Features in the design of the Oehmichen projector for Ozaphane film are: multiple tooth intermittent pull-down claws, low tension, separately adjustable gate shoe pressure springs, and friction rollers to assist feed and hold-back sprockets. These features are claimed to permit as many as 40,000 successive projections of a strip of film before it is worn out. Patent protection was granted on a considerable number of ideas relative to projector equipment and operation during the past six months.

#### Sound Picture Projection

The use of a separate projector for reproducing sound was initiated in a London theatre, the Pavilion, in November, 1930. It is stated that this is the first time such a scheme has been utilized in a British theatre. For preview service, in Hollywood, one company has provided two portable dummy sound projectors. These are installed in the theatre and coupled to the regular projector before the preview. This permits the studio to have a preview of a production using the assembled intercut prints of both picture and sound track and eliminates the necessity of making a sound print which usually requires cutting after the preview.

A rotating disk instead of the usual friction gate is used to control film

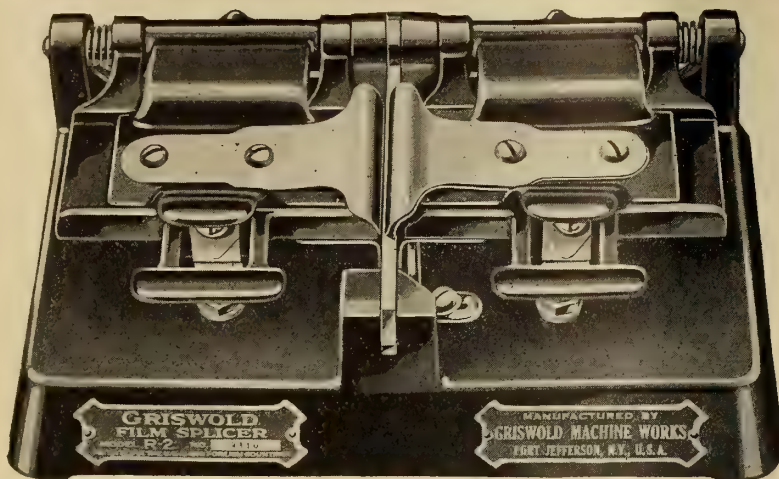
movement in a new type of sound projector. A sound-film projector, suitable for theatres seating not more than 1,000 persons, has been marketed. It is designed to operate on 110 volts, 50 to 60 cycles. This equipment is of several less expensive high-quality projectors for either film or disk records now available on the American market. Sound reproducing equipment is being manufactured by a British firm which uses a magnetic coupling between the projector and the turntable. A single photo-electric cell is placed centrally between two projectors. In another British sound apparatus, the photo-electric cell and amplifier unit are mounted on a chassis which may be inserted in the projector or removed quickly in case of failure of the unit.

#### Two Foreign Contributions

Difficulties encountered in equipping automobile sound-film projection units are discussed by Bull. The layout and installation of a typical truck for outdoor projection is described. Natebus has published a description of the Friess sound-film projector. The starting of the projector and fading are accomplished automatically by means of the film strip itself. The film is inserted in the projector for a change-over without regard to synchronization. Metallic contacts on the film then successively actuate relays which lower the needle into the proper groove, close the fader circuit, and extinguish the light in the first projector. Provision for automatic volume control is made and one type of equipment uses two disks, one above another.

In the Projectophone devised by Mihaly the sound track image is projected by a suitable optical system onto the photo-cell located at some distance from the projector. If the





*Known  
and used the  
World Around*

**M**ORE than 15,000 Griswold Film Splicers are in constant daily use throughout the world. For years the perfect splice has been made with a Griswold. Griswold is the standard film splicer for efficiency, durability and economy.

## GRISWOLD MACHINE WORKS

Port Jefferson, L. I.

New York

detector is located at one side of the main projector screen, the advantage claimed is that it obviates the need of wiring between the projection booth and the screen and there is no risk of extraneous noise being introduced from generators. A caesium photo cell is used.

The importance of periodically checking up the performance of the sound equipment has been stressed repeatedly by writers in the trade publications. The paper by Wolferz is of interest, therefore, as it deals with a portable test set for measuring voltages testing circuits, amplifier and rectifier tubes, etc., on any sound projector installation.

Many theatre stages have insufficient space backstage for a horn installation for sound picture projection. For such theatres, as well as for any theatre where only a limited space is available for the loud-speaker installation, a shallow horn has been introduced by Western Electric. The horn is provided with twin air columns which meet in a common mouthpiece. The equipment is 26 inches deep, 107 inches wide, and 62 inches high.

A super-electrodynamic speaker was described at the Fall, 1930, Meeting of the Society by Serge, who emphasized the importance of the acoustical coupling between the loud speaker and the auditorium. A valve controlling the flow of compressed air into the small end of an exponential horn was introduced in a new type of reproducer as a useful asset to loud-speaker performance.

### "Ground Noise" Problem

A rather detailed analysis of ground noise in relation to sound reproduction has been prepared by Tasker, who warns against vibrations in the recording equipment. Stryker has shown experimental measurements of scanning losses under various test conditions to be in excellent agreement with those which would be anticipated from a theoretical study. The conclusion is drawn that with proper design and adjustment, optical systems need not be responsible for an appreciable loss of efficiency at the higher frequencies used in reproduction.

Changes in sound reproduction caused by varying slit width have been considered by von Hartel. Besides presenting formulas showing the relation between the sound intensity and the width of the slit, the paper gives data showing that halation causes overtones which consist especially of octaves. A mathematical analysis has been made by Frieser and Pister of the effect on sound reproduction of a finite slit width, inclination of the slit to the direction of motion of the sound track, and non-uniformity of illumination of the slit. Livadry has treated the relative efficiency of different optical slits and their frequency characteristics in sound recording and reproducing.

### Light Sensitive Cells

Frediani avoids the use of photo-cells in reproducing sound from variable density records by passing them between electric contacts connected

## Universal Film Splicing Machine

MODEL NO. 3

Pat. March 22:22

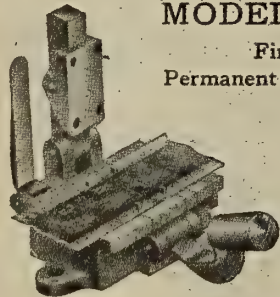
First-Class Results on New or Old Film  
Permanent Gauge No Adjusting

FOR THEATRES, EXCHANGES  
LABORATORIES, SCHOOLS

**Price \$6.00**

GENERAL MACHINE CO., INC.  
816-826 East 140th St., NEW YORK, N. Y.

For sale by all Supply Dealers



**KEEP all your COPIES of  
MOTION PICTURE PROJECTIONIST  
AS A REFERENCE FOR CURRENT  
AND FUTURE NEEDS—PRE-  
SERVE THEM IN A  
BINDER**

**\$2<sup>00</sup>**  
**each**

GOOD SOLID  
IMITATION LEATHER  
—GET ONE

ORDER FROM THE MOTION  
PICTURE PROJECTIONIST

**BINDERS**



with the grid circuit of a thermionic amplifier. For such reproduction, paper prints may be used. A general paper giving details of photo-cell design has been published by Schroter. A photo-cell made with cuprous oxide, according to another article, possesses high efficiency. Roth has dealt with recent developments in the Selenophone process which uses a selenium cell in connection with sound reproduction.

Graham estimates that 10 per cent. of the population who cannot hear sound pictures satisfactorily will be able to benefit from the use of a theatre hearing aid device which he described in a paper. Articulation *vs.* loudness curves are used to determine the amount of aid possible for any particular degree of deafness. Numerous patents were issued which disclosed improvements in sound reproduction equipment.

#### Lenses, Shutters, and Light Sources

The recent use of screen pictures of large size has led to the development of lens turrets on projectors with objectives of the desired focal length ready to be moved into position to suit the requirements of the program. Lenses of anastigmatic quality have been applied as the objectives for theatre projection work, as reported by Rayton. Their aperture ratio of  $f/2.3$  requires a special condenser system of large diameter if screen illumination is to be secured. Schering has published a report on the efficiency of projection optical systems in ten German theatres, based on measurement of screen illumination.

In a British process for scouring a wide picture on the screen from 35 mm. film, a pair of achromatic cylindrical lenses is used, one concave and one convex, the ratio of foci being in relation to the degree of expansion of the image desired. A pair of spherical lenses is placed in front of the achromats to correct for aberrations. A similar lens installation is used in the camera except that the optics are arranged to compress the images.

To utilize all the beam issuing from the film aperture of a projector using a mirror arc, Hauser and Mohr conclude that the relative aperture of the objective lens must be greater than that of the mirror, defined by the ratio of the diameter of the mirror to the distance of its center from the film. A limited number of patents was issued dealing with projector lenses and shutters.

#### Survey on Eye-Strain

It is generally considered that little trouble from eye-strain is experienced by normal persons viewing a motion picture in a theatre where the projection is satisfactory. This is particularly true in the United States, but projection standards abroad are apparently not as satisfactory as they might be, as shown by the results of a questionnaire circulated among Italian school children, teachers, and eye experts. Thirty-three per cent of the children experienced eye-strain persistently under good projection conditions or occasionally. For normal

# Hoffmann-Soons

## PERFECTION

### Best by Test!



Extravagant claims are easily made, but performance proves the worth of any equipment. Hoffmann-Soons Rheostats prove their worth by performance—in operation daily all over the world these rheostats demonstrate their superiority in the manner that counts—best by test!

#### THE ONLY UNION MADE RHEOSTAT

*Recognized as the Highest Standard everywhere*

Now equipped with solderless, adjustable lugs to take wire sizes from No. 4 to No. 4/0 without any additional cost.

We build rheostats for special requirements. Communicate with us Direct. There is no obligation. Sold by all Branches of NATIONAL THEATRE SUPPLY CO., SAM KAPLAN, NEW YORK, CONTINENTAL THEATRE ACCESSORIES, and by your dealer.

#### HOFFMANN-SOONS

Electrical and Engineering Corporation  
387 First Ave., Mfg. Division, New York

Contracting Electrical Engineers—Moving Picture  
Theatre Electrical Specialists

# RHEOSTATS

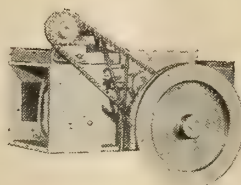
## BUY SOUND-ON-FILM NOW!

Through an arrangement with Weber Machine Corp., World's Largest Independent Manufacturer, we offer for the first time

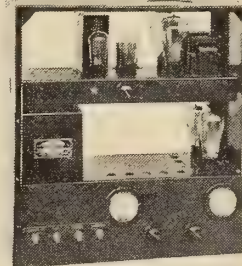
AN ALL A.C. OPERATED SOUND FILM EQUIPMENT  
AT THE STARTLING PRICE OF

### \$395.00

COMPLETE



This price for theatres seating up to 500. For theatres up to 2,000 seats, \$100.00 additional, this providing meters and changeovers.



Deliveries on Powers or Simplex start August 1st

NOTHING ELSE TO PURCHASE—NO BATTERIES—NO GENERATOR—  
INSTALLED IN A DAY'S TIME

Complete with Sound Heads, Main Power Amplifier, Speakers for Stage and Booth, Meters, Volume Control, Tubes and all Necessary Connections.

#### WEBER SPECIAL SOUND-ON-FILM HEADS

SOUND HEADS COMPLETE WITH DRIVES—PHOTO CELLS—  
OPTICAL SYSTEMS—EXCITER LAMPS AND ALL WORKING PARTS **\$247.50**  
PER PAIR



#### SERVICE-ON-SOUND CORPORATION

Dept. MP

Suites 607-609, 1600 BROADWAY  
NEW YORK CITY  
Cable Address—SOSOUND, New York



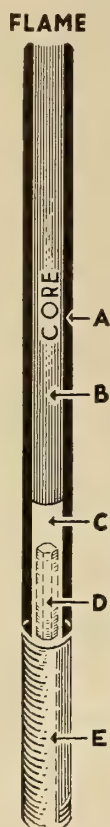
## "CASCO" CARBON SAVER

(Patent Applied)

*An Invention Long Awaited and Enthusiastically  
Welcomed By Exhibitors and Projectionists*

**No More Waste on Hi-Low  
and High Intensity Carbons**

**Burn Your Hi-Low and High Intensity  
Carbons Down to 2 Inches and Less**



### LEGEND:

The Carbon  
Saver  
consists of:

Rod "E" and extension "D". The extension "D" is inserted into the opening of "C" provided for in the carbon. "A" is the shell of the carbon. "B" is the core of the carbon.

No preparation of the carbon whatever is required. No inconvenience or waste of time for the projectionist. The Carbon Saver is merely inserted in the opening provided for it in the carbon. Carbons (patent applied), ready for use with the Carbon Saver, are sold by

**CARBON PRODUCTS, Inc.**

8 Beach Street, New York, N. Y.

*For further details apply to:*

**CARBON SAVER CO., Inc.**

8 Beach Street, New York, N. Y.

tions, there should be no fatigue with shows of moderate length. A British report suggests that a screen illumination of 7 foot-candles would be a feasible and suitable value. It is also proposed that the angle of elevation of the eye to the top of the picture should be limited to 35 degrees.

Causes of variations in light and steadiness of high-intensity carbons were discussed by Joy and Downes. The demand for higher powered light sources in the theatres, using low-intensity reflecting arc lamps, has been met by the production of a higher current trim. This consists of a 13 mm. by 8 in. cored positive carbon and an 8 mm. by 8 in. cored negative. It is designed for 32 to 42 amperes at the arc. Previously, 32 amperes at the arc was the highest attainable. The introduction of a pre-cratered high-intensity projection carbon was also noted. These carbons are supplied as 9 mm. by 20 in. and are said to burn more quickly and smoothly.

Dash has discussed the most suitable way of connecting generators for the operation of projection arc. Naumann has summarized methods for computing data on illumination in projection work.

### Special Projection Equipment

During the presentation of the stage play *Miracle at Verdun*, at the Martin Beck Theatre, New York, in March, 1931, sound motion pictures were combined effectively with the stage action. Three separate synchronized projectors were used to project pictures on three screens arranged back stage in the form of a huge cross. Six horns were used behind the screens and others above the proscenium arch and at points in the auditorium. A patent covering apparatus for projecting a plurality of sets of motion pictures was issued.

### Stereoscopic Projection

According to Taylor, stereoscopic vision requires that two eyes, related physiologically and psychologically, each view separately, distinctly different pictures. Several available methods for independent left and right eye vision are discussed in this article.

Considerable research has been conducted by Ives to devise cameras and projectors for the production of pictures showing relief. The results of some of this work have been published in recent issues of the *Journal of the Optical Society of America*. The method consists, essentially, of making a series of pictures from juxtaposed points around an object and projecting the prints from these onto a special screen. The requisite properties of the screen are (1) the light beams must be reflected directly back toward the projectors with no lateral spread, and (2) a vertical spread or diffusion should be introduced. Two types of screens having these properties have been developed, one made of vertical solid celluloid rods and the other of strips of mirror. More recently a stationary camera requiring only a single exposure has been devised but Ives indicates that much ad-

## SUPER-LITE LENSES

**WISELY CHOSEN BY  
AMERICA'S BEST THEATRES**

### New Bifocal Super-Lite Lens

An adjustable focus lens with a wide range of foci for both silent and sound film.

### Series III. Super-Lite Lens

Standard full Half-Size lens furnished in short focus as low as 4" E. F. and up to 10" E. F.

### Series IV. Super-Lite Lens

Full 3" diameter lens to meet the demand for more light for longer throws. 6" E. F. to 10" E. F.

*Quality Guaranteed*

**PROJECTION OPTICS CO., INC.**

330 Lyell Avenue

ROCHESTER, N. Y.

U. S. A.





ditional research is needed to perfect the process.

A limited number of patents, chiefly French, have been issued relative to stereoscopic projection. Several interesting patents have been issued on this subject recently but no articles of importance have been published.

#### Projection Screens

As noted earlier in this report, wide screens have been installed in many theatre circuits as an aftermath, perhaps, of the wide-film movement. A larger picture has certain advantages which exhibitors desire and it is a simple expedient to mask the screen down for smaller picture projection if the larger screen is not desired. In connection with one group of theatre operations, the following table represents the screen sizes used for various projection distances, all the dimensions being in feet:

Distance	40	60	80	110	120
Height	8.5	11.5	14.5	17	19
Length	11.0	15.5	19.5	22	25.5

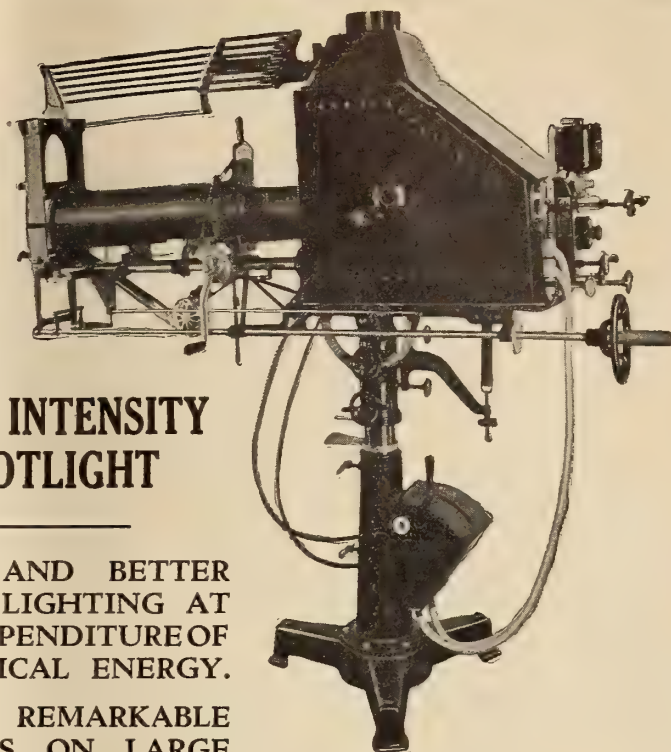
A diffused border is favored in the masking of close-ups. Kreuzer has analyzed data for measuring light reflection and sound transmission characteristics of screens. A fire-resistant material for construction of motion picture screens has been announced which, it is claimed, will ignite with difficulty and will not propagate flame beyond the area exposed to the flame.

A method of testing motion picture screens according to Little involves brightness measurements in two planes mutually perpendicular and perpendicular to the screen on which the incident beam is inclined at some angle above the screen axis. Tests of screen color in relation to the color of the light source are recommended.

Three new types of screens have been described in the literature as being commercially available. A non-inflammable screen of rubber composition perforated with small holes was demonstrated in November, in London. Another type of screen incorporates a cooling system for the theatre. Behind the metal screen surface is located a refrigerating plant which causes the screen to become entirely coated with white frost. In the third type, a non-glare and pseudo-relief principle is introduced. A pigment is used to cover the surface with a regular pattern which is claimed to absorb the harmful rays and reflect the remainder. The same amount of light is claimed to be reflected regardless of the viewing angle commonly prevailing in the average theatre. Comparatively few patents were issued disclosing improvements in screens.

#### General Illumination

Shook has described an instrument for the projection of "mobile color," which utilizes a single light source and three rotating disks on which are placed various optical devices and light filters. An instrument called the "Mutochrome" has been designed by Smith for projection of scenic backgrounds or color schemes for the de-



## HIGH INTENSITY SPOTLIGHT

MORE AND BETTER  
STAGE LIGHTING AT  
LESSEXPENDITURE OF  
ELECTRICAL ENERGY.

MOST REMARKABLE  
RESULTS ON LARGE  
STAGE SETS.

**HALL & CONNOLLY, INC.**

24 Van Dam St.

New York, N. Y.



## Your Preference, Please!

**T**HE editors of MOTION PICTURE PROJECTIONIST solicit your aid to the end that this publication may be of the maximum service to you. Every subscriber can do his bit to improve this service by using the space provided below to indicate his preference for special articles and other material in which he may be particularly interested.

Let us know your preference, please. All requests will receive attention in the order of their receipt, so act quickly. Use the blank below to tell us in just what subject you are particularly interested. Do it now!

Editor,

M. P. PROJECTIONIST:

I am interested in the following subjects, on which I should like to see information in MOTION PICTURE PROJECTIONIST:

1. ....
2. ....
3. ....
4. ....

NAME .....

ADDRESS .....



sign of decorative materials. It consists of a number of similar optical systems together with prisms for obtaining light from a common source.

Since the advent of the sound motion picture, more and more attention has been given to the question of the size and shape of auditoriums. Physical requirements, such as plot, building restrictions, etc., influence the choice. Any set formula is usually of little value but from experience to date it would appear that the most satisfactory results from the standpoint of sound reproduction are obtained in theatres having a maximum seating capacity of not over 2000 seats. In theatres of much larger seating capacity, the sound quality suffers considerably when the auditorium is only partially filled, whereas in the smaller theatres this condition is not as serious.

A chain of midget motion picture picture houses is being planned for operation throughout the United States. The seating capacity will average about 200 and the shows will vary in duration from 15 minutes to 1 hour, as it is considered that some theatre-goers desire only a short period of entertainment in their spare time.

About 55 per cent. of the 22,731 theatres in the United States are now wired for sound. In an open air theatre in Shanghai, China, the projector is enclosed in a cement booth and the sound screen has been placed before the back of the stage erected for dramatic performances. The theatre seats 3000 persons and dialogue can be heard clearly 400 feet back from the screen. According to a U. S. Bureau report, acoustic problems in Brazilian theatres are very difficult to solve. Walls are made of concrete or stucco and seats of plain wood. It is extremely difficult to use drapes as the insects attack most materials used. Electric current is quite unsatisfactory in many cities for sound installations. There is also a scarcity of skilled projectionists.

#### Television Developments

At a test made on February 12th, in the General Electric Laboratories, the features of a professor of the University of Leipzig, Germany, were recognized by his friends as televised across the Atlantic ocean from Schenectady. According to the same article, progress has been reported in the making of motion pictures of televised images. About 1000 television sets are reported to be in use in the United States. Jenkins has suggested a scanning screen for television composed of a plurality of cells, each actuated by its own shutter, composed of aluminum foil and controlled electrostatically by means of a synchronous commutator. A motion picture film was used by Sanabria at Chicago in demonstrating the projection of a televised image on a screen 10 feet square.

Ives has made further progress with his television experiments and has found that scanning by purple light gives better reproduction of image tones. Potassium photo-cells sensitive to the blue component of the purple light were used in conjunction with caesium cells for the red. Ives

has also constructed a three-channel system in which prisms, placed over the holes in a scanning disk, direct the incident light into three photo-electric cells. The three sets of signals are transmitted over three channels to a triple electrode neon lamp placed behind a viewing disk also provided with prisms over its apertures. An image of 13,000 elements is thus produced. Good telephotographs contain about 250,000 elements, however, and according to Gannett it is quite impractical under present conditions to radio-broadcast such pictures as it would require a frequency band 4 million cycles wide, the equivalent to 400 ordinary broadcast channels. Such a band would mean nearly complete monopoly of present transmitting channels.

A new multiplex system of television was introduced in England recently which uses a standard motion picture projector for transmission of pictures. Five transmission channels are employed, each transmitting one-fifth of the picture. Much more light is therefore claimed to be available to illuminate the receiver screen, which may be full size. Two patents dealing with television methods were noted.

#### Color Cinematography

Comparatively few color motion pictures were released during the past six months. Nevertheless, laboratories equipped for color work continued to improve their processing equipment and devise additional refinements in their processes. With the marked improvement in the speed and color-sensitivity of panchromatic emulsions, coupled with improvements in optical systems, lighting equipment, and processing, it is likely that further refinements will be forthcoming in cooler print quality.

Clark has prepared a list of 32 color processes which have been enjoying more or less commercial exploitation during the past year. The list is stated to be incomplete but some evidence of the interest being shown in color processes may be gained from an examination of it. Although it is evident from an inspection of the list that subtractive processes, requiring no change in projection equipment, have been the most popular, it is significant that a well-known producing organization demonstrated a three-color additive process at the meeting of the New York Section of the Society in December, 1930. Both originals and prints made by this process (Keller-Dorian), were shown. The film has horizontally embossed lenticulations and the copies were said to have been made by a new optical printing process.

In order to reduce extra noise accompanying the running of a sound color camera, Benson has suggested that the camera be enclosed in an evacuated housing mounted on a resilient pad. Macrae offers the suggestion that the screen should be farther front the front seats for an all-color program than for an ordinary program. The extent of the "color field" is less than for a normal field of view since the sensitivity of the eye for

### Index of Advertisers

Bell Equipment Corp. ....	4
Best Devices Co. ....	34
Bioscope, The ....	35
Blue Seal Products Co. ....	37
Brenkert Lt. Projec. Co. ....	6
Carbon Saver Co. ....	40
Chalmers Publishing Co. ....	35
Eastman Kodak Co. ....	5
Fish-Schurman Corp. ....	5
General Machine Co. ....	38
G-M Laboratories, Inc. ....	35
Griswold Machine Works ....	38
Hall & Connolly, Inc. ....	41
Hertner Electric Co. ....	7
Hoffman & Soons, Inc. ....	39
Ilex Optical Co. ....	Front Cover
International Projector Corp.,	Back Cover
Kaplan, Sam, Mfg. & Supp. Co. ...	2
Movie Supply Co. ....	35
National Carbon Co. ....	3
National Theatre Supply Co. ....	43
Projection Optics Co. ....	40
Rice, J. M., & Co. ....	35
Roth Bros. & Co. ....	9
Service-on-Sound Corp. ....	39
Strong Electric Corp. ....	34
Technicolor, Inc. ....	—
Universal Elec. Welding Co. ....	36
Weber Machine Corp. ....	36
Western Electric Co. ....	13
White Engineering Corp. ....	8

color diminishes toward the periphery of the field of vision. A general review of the processes of color photography was presented by Matthews before the Fall, 1930, Meeting of the Society. A limited number of patents were issued dealing with cameras and projectors for three-color additive processes.

Four patents were noted disclosing methods of manufacturing multicolor screen films. Lenticular screen processes were protected by two patents. Three patents were issued covering two-color additive processes for cinematography. Brewster and Miller have advanced suggestions based on experimental research regarding the most promising process for making three-color subtractive motion pictures.

The Pilney system of color cinematography makes use of two laterally inverted images photographed side by side on a double width film which is folded down its length for projection purposes. Special double coated positive stock is used but technical details have not been published.



# MORNING

# NOON

# MIDNIGHT

*National is on the Job!*

If there is any one thing more aggravating than trouble in the projection room, it is having to wait on snail-like supply service to correct it. When a breakdown occurs, it's generally up to the projectionist to get things going again . . . and that's when he needs quick action. Most projectionists now know who to rely on when they want a replacement part in a hurry or relief equipment to meet an emergency. Day or night they call National, and National is always on the job with plenty of Genuine Repair Parts and Speedy Delivery.



THE SYMBOL OF  
BETTER SERVICE

**NATIONAL THEATRE  
SUPPLY COMPANY**  
*Branches in all Principal Cities*



# *Simplex* The International Projector

TRADE MARK REG'D.



## IN JAPAN



AND

THRUOUT THE WORLD  
IS USED BY THE FINEST  
MOTION PICTURE THEATRES

*Simplex*  
The International Projector

PRACTICAL PROOF of WORLD WIDE

*Simplex* Superiority and Supremacy

FROM

ELABORATE CATALOGUE ISSUED BY

ACME TRADING COMPANY, INC.

No. 9, MINAMI-SUMIYA-MACHI, MINAMI-KU,  
OSAKA, JAPAN

TRANSLATION

*Simplex* PROJECTOR  
IS A GOOD INVESTMENT

INFERIOR MACHINES ARE LESS RELIABLE  
AND MORE DIFFICULT TO OPERATE

*Simplex* PROJECTOR

GIVES BETTER PROJECTION  
IS MORE DEPENDABLE AND  
PARTS ARE EASILY REPLACED

映寫機は、  
買價か？ 投資か？  
結局、粗悪な、間にあはせの機械は、他人の借  
金を背負い込んだ様なものであります。一方、修  
理、又、修理で、經常費が、嵩むのみならず、他  
方では肝心のお客には、満足と與へる事は出来ま  
せんから、上等の常得意の客は、三年立つても出  
来る筈がありません。  
之に反して、シンプレックス映寫機は、よい投  
資であります。蓋し、シンプレックスは、殆んど  
修理の要なく、萬一、破損の場合は、其の必要な  
部分のみを取りかへればよろしいので、映寫技  
師なら、誰れでも出来ますから、極めて、安價で  
済みます。  
シンプレックスは  
お得意名簿の守本尊  
且つ、シンプレックスの寫す映寫面は、シンプ

無動搖、無閃光のものでありますから、お客は、



レックスのみが持つスチールの様な、絶対静止、

(備設著四スクラップン) 室寫映 座竹松 堀頓道阪大

# INTERNATIONAL PROJECTOR CORPORATION

92 GOLD STREET

GENUINE SIMPLEX PARTS GIVE MOST SATISFACTORY RESULTS

NEW YORK



# MOTION PICTURE PROJECTIONIST

*(Fourth Year of Publication)*

## THE ILEX F:2.5

STANDARD ADJUSTABLE  
PROJECTION LENS

### SHORT FOCAL LENGTHS

A new era in screen presentation brings forth larger pictures and wider screens. "Grandeur" effects from 35mm. film are now possible for every theatre with ILEX, offering the finest short focal length lenses that the present day market affords. This is true because ILEX lenses are corrected for critical definition, maximum sharpness, brilliant illumination and flatness of field. Slop-over and incomplete covering of the screen are cared for by the exclusive ILEX adjustable feature.

For the projection equipment you use, ILEX lenses are the best . . . perfect in performance . . . faithful in service. We can furnish engineering data and interesting literature to cover your projection problems.

ILEX OPTICAL CO. ROCHESTER, N. Y.



FURNISHED IN A WIDE RANGE  
OF FOCAL LENGTHS  
2½" to 9"



OPTICAL PRODUCTS OF PRECISION

# ILEX OPTICAL CO.

INSIST UPON ILEX — THE LENS THAT PUTS PERFECTION IN PROJECTION

A Mancall  
Publication

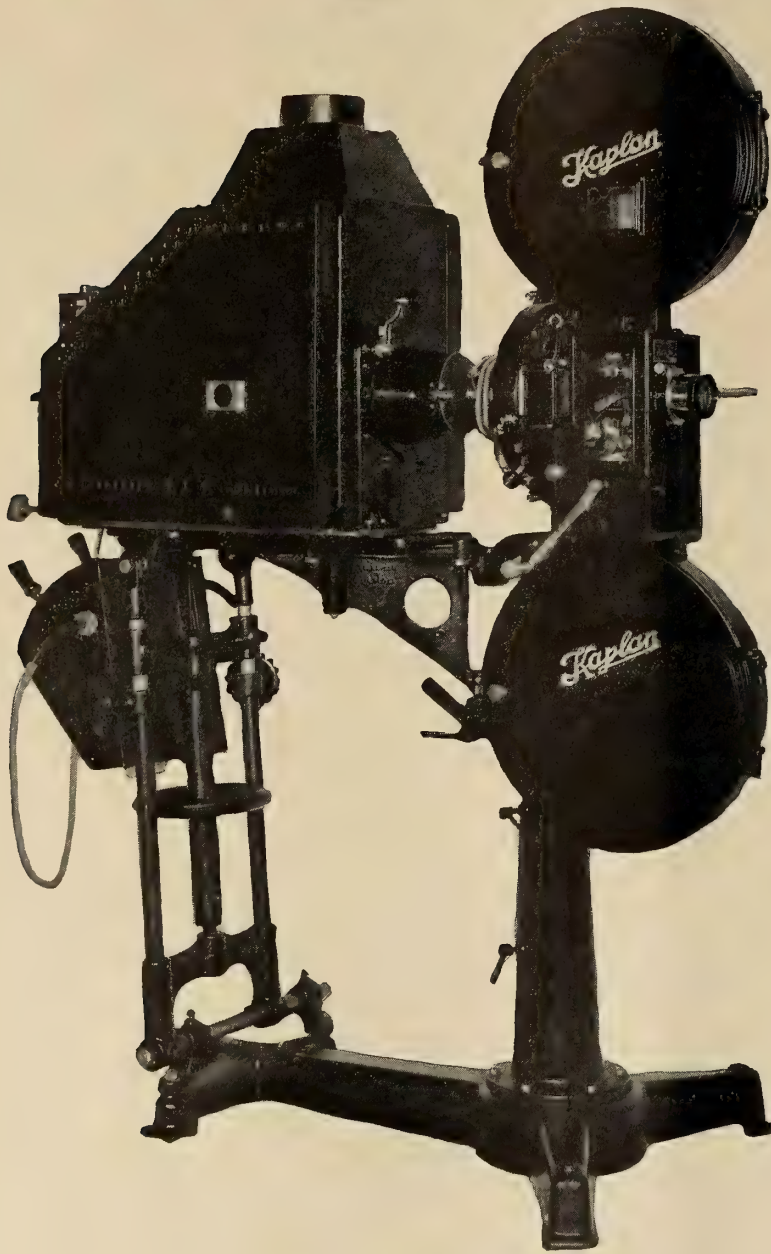
SEPTEMBER, 1931

Vol. 4, No. 11  
25c. per copy  
\$2.00 per year



# Kaplan

## PROJECTOR



The Kaplan projector has been standard equipment in many of the country's leading theatres for many years. Time has proven it to be a mechanism based on the soundest of engineering principles, both in design and construction.

Rigid — where rigidity is essential; no vibration; easy, smooth-running, noiseless, and long-enduring, it stands as a monument to the best and most modern factory methods and engineering work. Performance over a

long period of time is the acid test of all good product. Time and performance have been the best salesmen for the Kaplan Projector.

*An Engineering Product*

**SAM KAPLAN MANUFACTURING and SUPPLY COMPANY, Inc.**

729 Seventh Avenue

--

--

New York City



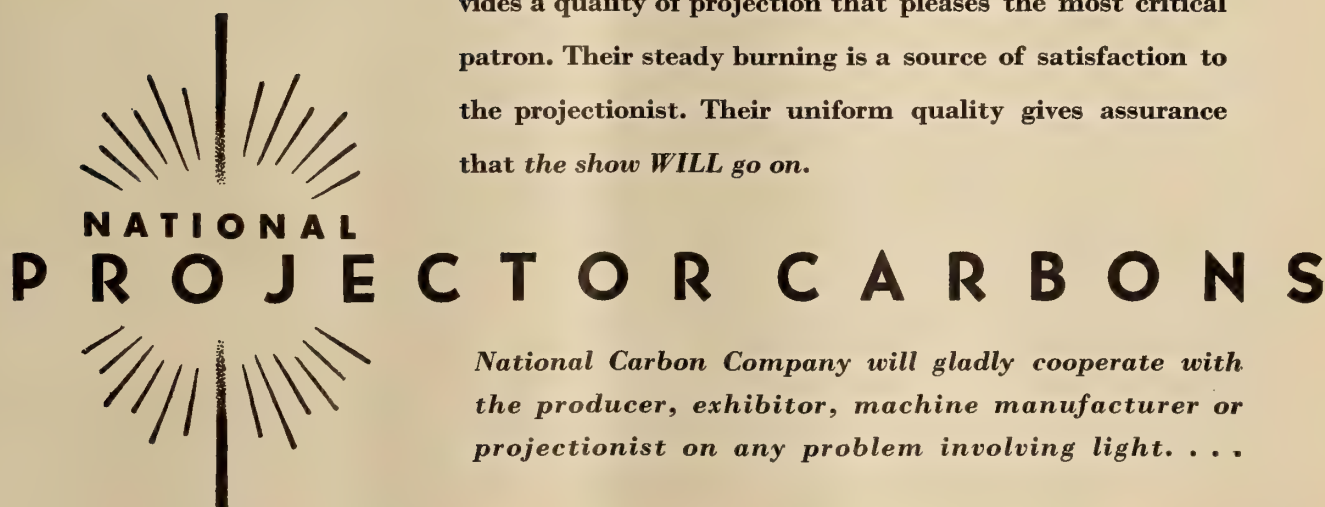
# The Show

## . . . . MUST Go On

**F**ROM the beginning of the motion picture industry, on through the many stages of rapid development, National Carbon Company research engineers have kept in mind that unwritten law of the theatre—the show *must go on*. That is why National Projector Carbons are dependable.

Larger theatres, longer throw, sound, color and wide film have each, in turn, made their demands. Each new development has called for greater volume of illumination, for higher current through these slender pencils of carbon, for more intense crater brilliancy.


Extensive research and constant improvement in manufacturing methods have enabled National Projector Carbons to meet each new demand. Their brilliant white light provides a quality of projection that pleases the most critical patron. Their steady burning is a source of satisfaction to the projectionist. Their uniform quality gives assurance that *the show WILL go on*.



*National Carbon Company will gladly cooperate with the producer, exhibitor, machine manufacturer or projectionist on any problem involving light. . . .*

**NATIONAL CARBON COMPANY, INC.**

Carbon Sales Division      Cleveland, Ohio

Unit of Union Carbide  and Carbon Corporation

Branch Sales Offices:    New York    Pittsburgh    Chicago    San Francisco



# INDICATES



# SOUND LEVEL

● With Weston Model 571 OUTPUT METER, correct sound volume in the auditorium may be determined from the projection booth.

● Model 571 measures the voltage output of sound apparatus—at speakers or any other convenient point. Notation may be made of the voltage outputs that produce the correct sound level for different capacity audiences. After this, the sound level may be regulated reliably and definitely from the booth by checking voltage output.

● Variations of voltage output—a possible breakdown—are immediately indicated with Model 571. This warning enables a change-over to the reserve circuit without annoyance to the audience.

● Besides, Model 571 OUTPUT METER is used for checking the relative volume of speakers, for determining the relative gain of tubes, and for determining fader settings.

● Developed to solve a practical problem that confronts every projectionist, Weston's 571 OUTPUT METER helps satisfy critical audiences. Its moderate price brings it within reach of every one interested in quality sound reproduction.

**Write for circular RR**

# WESTON

**ELECTRICAL INSTRUMENT CORP.**

617 FRELINGHUYSEN AVENUE...NEWARK, N. J.

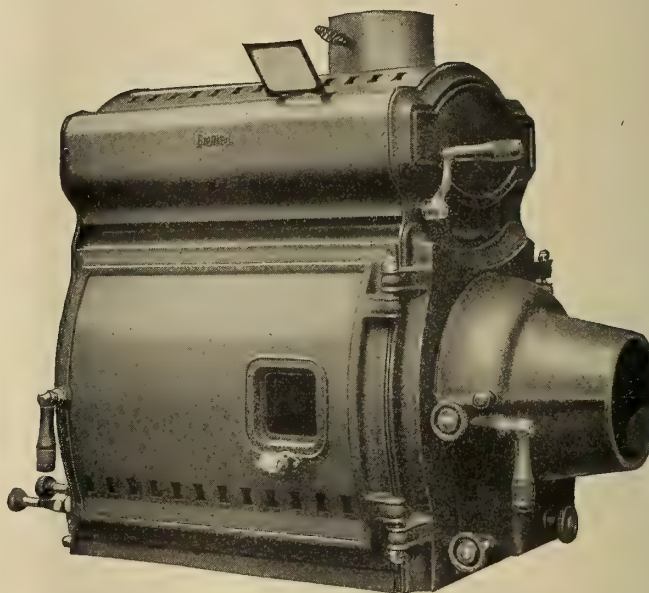
# LEADERSHIP



is not an abstract term when applied to projection lamps. Leadership today expresses how far a manufacturer has progressed or lagged behind in the construction and performance of his product. Enthusiastic Brenkert users from coast to coast, whose experience places them in position to KNOW, are a true expression of Brenkert leadership.

# Brenkert

## SUPER HIGH INTENSITY PROJECTION LAMP



*Distributed by Independent Theatre Supply Dealers*

Ask  
Any  
User



Write  
for  
Literature

CORRECT DESIGN—PRECISION CONSTRUCTION

**BRENKERT LIGHT PROJECTION CO.**

*Engineers & Manufacturers*

ST. AUBIN AT EAST GRAND BLVD., DETROIT



# MOTION PICTURE PROJECTIONIST

September, 1931

Vol. 4, No. 11

CHARLES E. BROWNELL, Editor  
Lester Isaac, *Efficiency*; J. H. Kurlander, *Light*; Thad Barrows, *Conservation*; J. E. Robin, *Equipment*; W. W. Jones, *Theory*; R. H. McCullough, *Sound Projection*; Harry Rubin, *Improvement*; Victor Welman, *Personnel*; Sidney Burton, *Production*

Published monthly by Mancall Publishing Corp., 7 West 44th St., New York City. Subscription rates in U. S. and Canada: twenty-five cents per copy; two dollars per year; three dollars for two years. Add one dollar for foreign postage. Changes of address should be submitted three weeks in advance of publication date to insure receipt of current issue. Entered as second class matter Oct. 25, 1927, at Post Office, New York, N. Y., under the act of March 3, 1879. Additional entry at New Brunswick, New Jersey.

## Canadian Representative

H. N. Elliott, 203 Vaughan Road  
Toronto, Canada.

## Australian Representative

McGill's Agency  
179 and 218 Elizabeth St.  
Melbourne, Australia.

## Advertising Manager

Mortimer Glancoff

## Editorial & Advertising Office

7 West 44th St.  
New York City.



## Welch Begins New Series of Technicolor Musical Shorts

Robert E. Welch, who produced a series of Technicolor shorts, "Beauty Secrets from Hollywood," soon to be released by Paramount has commenced work on a new series of color musical films.

The first, "Old Songs For New," illustrating scenes from old favorites has just been completed. Among the popular numbers included in the revue are "Alexander's Ragtime Band," "Waltz Me Around Again Willie" and "A Bicycle Built for Two."

"Sympathetic treatment of the old tunes is the idea behind the film," Mr. Welch explained. "I think the public will like it."

Both the Beauty Secrets series and the new group will be shown in the improved Technicolor process, the first demonstration of which in Radio's picture, "The Runaround," was much praised by critics.

# NEARER AND NEARER

... comes the day when ultra-speed motion picture negative will eliminate slower emulsions. The latest impetus is supplied by the new gray backing on Eastman *Super-sensitive*. This advance is of particular interest to the exhibitor and the producer. Definitely improving photographic quality, it means more artistic, more pleasing, more satisfying pictures. And these factors have definite box-office value. Eastman Kodak Company, Rochester, New York. (J. E. Brulatour, Inc., Distributors, New York, Chicago, Hollywood.)

## EASTMAN SUPER-SENSITIVE

Panchromatic Negative, Type 2

## F. S. C. OPTICAL CROWN PLATES

For enclosing Port-  
holes of Projection  
Booths

PRECISION SURFACES  
NO DISTORTION

## S. O. G. "IGNAL" CONDENSERS

Made of extra heat  
resisting Optical  
Glass

ALL SIZES  
ALL FOCAL LENGTHS

Sole Distributors

## FISH-SCHURMAN CORP.

45 West 45th Street

New York City, N. Y.



# THEY KEEP A-RUNNING



20/40 to 100/200 Ampere 2-Bearing Actodector

## MULTIPLE ARC OPERATION

### ROTH Emergency Lighting Plants

are giving thoroughly dependable satisfaction in many of the largest circuit and independent theatres.

The steady, even power supplied to motion picture projection arcs by Roth Multiple Arc Actodectors results in a uniformly brilliant and intense screen illumination. Any number of arcs can be carried within their ampere ratings—20 to 600 amperes . . . Because of their quiet operation they are particularly suitable for use with sound equipment...Furnished in 2- and 4-bearing types.

### ROTH BROTHERS AND COMPANY

*Division of Century Electric Company*

1400 W. Adams St.

Chicago, Ill.

*Distributors and Offices in all Principal Cities*

DIRECT CURRENT  
MOTORS AND  
GENERATORS



MOTOR GENERA-  
TOR SETS AND RO-  
TARY CONVERTORS



# As *The* EDITOR Sees IT

§ *Looking Toward the Future*  
SOME few years ago, certain persons whose business it is to know, prophesied that the installation of sound equipment in the theatres of the United States would reach its saturation point within a period of from three and one-half to four years. In other words, at the end of this estimated period, all or at least the vast majority of the exhibitors in this country would have purchased and equipped their houses with some type of sound reproducing apparatus.

Whether the saturation point has been reached, or will be reached in one year, two years, or even five years hence is for the purpose of our discussion immaterial. One fact, however, is obvious, and that is that the supply of unwired American houses is not inexhaustible. The end will eventually arrive. What then? What will the manufacturers of sound reproducing equipment do? Can they, like the Arabs, "fold their tents and silently steal away"? We think not. There are many varied and cogent reasons why such a step cannot be taken. For example:

The financial investment represented by even one of the smaller of the sound equipment manufacturing concerns is enormous. Such an investment entails certain definite and distinct obligations and responsibilities.

There is the responsibility to the stockholder, which is, of course, the obligation of making money—even in the face of an apparently curtailed or flaccid market.

There is the responsibility represented in the money invested in the plants and the machinery required for manufacturing the equipment. Manifestly such plants and machinery cannot be discarded or "junked" without serious and devastating financial loss.

Some of the larger sound companies, during the past few years, have acquired by merger or by other means partial or even controlling interests in certain theatre chains, the houses of which are for the most part equipped with their system of sound apparatus. This represents a direct obligation to the circuits involved and one upon which at least a portion of their incomes will depend.

Then there are responsibilities to the exhibitor in that certain of the sound equipment manufacturers have let their equipment to him on long term lease. And there are service contracts, the term of some of which, it is true, are nearing expiration.

These service contracts present in themselves an interesting problem. At the expiration of such a contract, what will be the attitude of the exhibitor. Will he renew the contract? Will the projectionist be called upon to service the equipment? What is to prevent some enterprising engineers and former installation and service

employees of these sound companies forming competitive service organizations? Granted a renewal of the vast majority of its service contracts, can the sound equipment company preserve even a semblance of its pristine power and glory on the income to be derived from that source alone? As is quite obvious, even this phase of the situation has its interesting and speculative aspects.

Manifestly, before such a condition arrives, something must be done. Great rivalry is bound to develop among the existing companies in their efforts to persuade the exhibitor to replace his present equipment with apparatus of a different manufacture and "better and more scientific" construction. Patent litigations loom upon the horizon. War and rumors of war. What the results will be, no man knows.

Even now it is whispered that the big sound companies are turning interested eyes toward the non-theatrical field. "Television is just around the corner"—in the laboratory. Sixteen millimeter sound film presents many attractive features—and perhaps certain problems doubtless of absorbing scientific interest, but not quite so commercially attractive. Certainly, even the perfect 16 mm. sound on film reproducing equipment will have to be sold. And when we say sold we mean just exactly what we say. We cannot conceive of 16 mm. sound equipment as being the indispensable necessity to the non-theatrical customer that 35 mm. sound reproducing equipment is to the exhibitor.

Grandeur film? Yes?—No? The sound companies make no secret of their interest. The practicability of grandeur film is an established fact. The realism of a panoramic screen is startling. For the large theatre, at least, the projected picture possesses distinct and attractive advantages—but will these advantages prove obvious to the exhibitor and attractive to his already overtaxed pocket-book? These and similar questions are ones that may well vex the minds of our friends the talkie producers—and by the same token, our friends the exhibitors.

In the meantime, what of the projectionist? Where will he stand? Well, if he is reasonably wise, normal, alert and practical, he will stand on his two feet—and this is not meant by way of a pun. He will keep his mind on his work and all the manifold duties that his work involves. He will keep himself posted by means of books and carefully selected reading regarding the latest developments in his chosen field. And then, come what may, he will be in a position to meet and to master it—just as competently and effectively as he has met and mastered the difficult and exacting technique of modern talking picture operation.

CHARLES E. BROWNELL



# Effective Operation of Projector Carbons

By E. R. GEIB AND W. C. KALB†

*In the following work the authors describe the various types of arc lamps in present day use, and discuss the principles and the peculiarities of each with suggestions as to its most effective operation.*—THE EDITOR.

THE Motion Picture Theatre has often been termed a picture palace, and rightly so, for it is a house designed especially for the projection of motion pictures and made beautiful by all the art and ingenuity of man. Its very existence is dependent upon the quality of the pictures displayed and this quality, in turn is dependent upon the light with which the pictures are projected upon the screen.

The latter subject, projection light, is constantly becoming a more important element in theatre management. Larger houses, longer throws, larger screens, color photography, sound and the demand for higher intensities of screen illumination have each necessitated the procurement of more light. Fortunately, the light source being carbon arc, it has been possible to provide it. Nor has the limit yet been reached. There is no reason why light sources of still greater power can not and should not be used. This discussion of the subject will, however, be confined to those light sources now in use, bringing out various points affecting the efficiency of operation.

## High Intensity Arc

The high intensity arc, the light source used in the largest theatres, will first be considered. Two types of high intensity arcs are in use in this country, one the condenser or, as commonly referred to, the high amperage type and the other the reflector type.

### Condenser Type—High Intensity

The condenser type is the one generally used in the largest theatres. It is designed in different capacities for operation at arc currents of 75, 100 to 130 and 150 to 160 amperes. The carbon combinations recommended for these amperages are as follows:

Amperes at Arc	Positive Carbon	Negative Carbon
75	11. mm. x 20" High Intensity Projector	11/32" or 3/8" x 9" Orotip Cored Projector
100 - 130	13.6 mm. x 20" " " "	3/8" or 7/16" x 9" " " "
150 - 160	16 mm. x 20" " " "	7/16" x 9" Orotip Cored Projector or 7/16" x 9" Orotip, Heavy Coated, Cored Projector

Of the three combinations shown above the most popular is the 13.6 mm. x 20", 7/16" x 9" trip operated at about 125 amperes. The lamps in which these carbons are used are the well known Hall and Connolly (H & C) Ashcraft and Brenkert Types.

The light from the high intensity arc, both condenser and reflector types, emanates from two distinct

sources, the crater and the tail flame. See Figure 1. The light from the tail flame represents about 30 per cent of the total light emitted from the arc but, since it cannot be focused and any appreciable portion of it utilized by the optical system, the projectionist is interested only in the crater light.

The candle power as well as the steadiness of operation is affected by the angle and relative position of the negative carbon with respect to the positive crater and by the voltage maintained across the arc. The angle is usually fixed by the lamp manufacturer but the position of the negative carbon with respect to the positive crater can be changed by moving

efficiency of the arc is sharply diminished.

Unfortunately, the position of maximum crater light is not the position of maximum steadiness since the edge of the negative flame will not hold steady on the lower lip of the positive crater. If, however, the positive carbon is slightly advanced from position A, so that the edge of the negative flame holds steadily on the under side of the positive shell, there will be practically no flicker in the useful light and the volume of effective light will not be seriously decreased.

Arc voltage does not afford a reliable basis for adjusting the relative position of the carbons since it is possible to obtain the normal arc voltage for a given current with the carbons in a position which gives much less than the maximum effective light. Properly adjusted, as described in the preceding paragraph, 13.6 mm. x 20" high intensity carbons, operating at 110-125 amperes arc current, require an arc voltage of approximately 67-73 volts. 16 mm. x 20" carbons at normal arc current require 73 to 83 volts at the arc.

While the high intensity arc is entirely automatic in its operation and little attention is required after the arc is struck, it is most essential that all working parts be regularly cleaned, tightened and oiled at all points where provision has been made. Especially should all corrosion and carbon particles be removed from the contact jaws and carbon holders. Dirty or corroded holders cause arcing which, in turn, impairs the ability of the carbon to carry the proper current and causes the carbons to needle or spindle. Some projectionists, after each shift, clean the entire inside of the lamp housing with a small hand vacuum cleaner, removing all dust and deposit which has accumulated. Needless to say, this not only prolongs the life of the equipment but makes it possible to obtain the maximum efficiency during its operation.

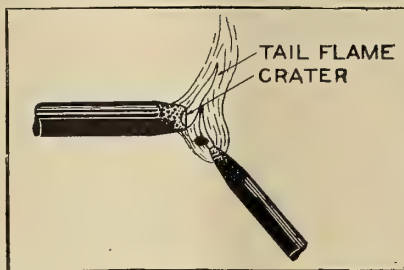


Fig. 1

the positive carbon backward or forward. Correct position is a matter of the greatest importance.

The crater of the positive carbon, as the name implies, assumes a cup-like form within which is contained a mass of incandescent vapor from which the effective light of the arc is radiated. When the negative flame just touches the lower edge of the positive carbon, as in position A. Figure 2, it seems to compress the positive flame within the crater opening and the maximum amount of useful light is obtained from the arc. When a good portion of the negative flame strikes the lower side of the positive carbon, as in position B, or when the negative flame is too far ahead of the positive carbon, as in position C, the positive flame is not confined to the crater so effectively and the

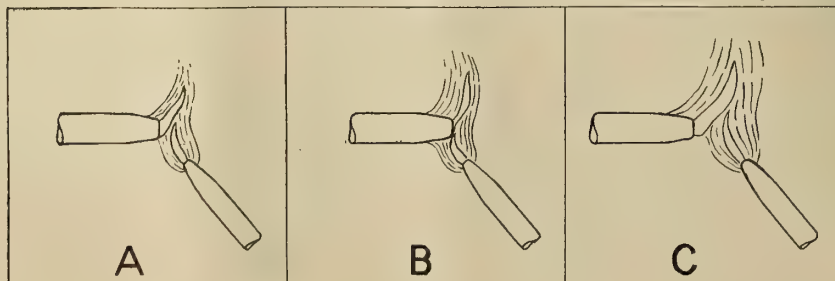


Fig. 2

†National Carbon Co., Cleveland, Ohio.



### Reflector Type—High Intensity

Much of what has been said regarding the operation of the condenser type, high intensity arc applies, as well, to the reflecting arc type. This type, which uses a 9 mm. x 20" high intensity positive carbon and a 5/16" x 6" or 9" orotip cored negative, is designed for 60-85 amperes arc current. The arc gap varies somewhat with the make of lamps and the recommendation of the manufacturer should be followed for best results. Care should be taken to keep the carbon trim in proper alignment. It is, of course, generally understood that the crater of the positive carbon must be in proper focus with the mirror.

### Low Intensity Arc—Reflector Type

The low intensity, reflecting or mirror arc lamp will now be considered. It is safe to say that there are more lamps of this type in service in this country today than all of the other types combined. The term low intensity, while correctly applied when comparing this type of lamp with the high intensity types, really does not do this lamp justice because, from the standpoint of light production, it is a marvel of efficiency.

When first introduced to the trade these lamps were operated at arc currents ranging from 12 to 15 amperes. Their performance was so satisfactory that higher and still higher amperages were employed until today the arc current ranges from 15 to 40 amperes. Some consideration is being given to the use of still larger carbons, permitting operation at even higher currents. The following table, however, shows only the combinations in use at the present time.

The light from this type of trim comes from the crater of the positive carbon which is pointed directly toward the mirror. Both carbons, as shown in Figure 3, are burned in a horizontal position. It is imperative that both carbons be in proper alignment horizontally and that the negative carbon be slightly lower than the positive. If the negative is set too

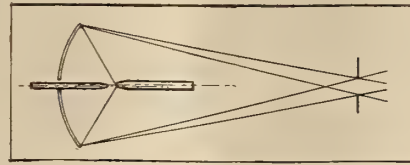


Fig. 3

low a lip will form on the upper edge of the positive carbon and the light will be thrown downward from the crater with a certain percentage lost insofar as its value for screen illumination is concerned (See Figure 4). In like manner if the negative carbon is set too high a lip will form on the lower edge of the positive with resultant loss of light at the aperture plate.

In this type of lamp, as in all others, carbon holders should be cleaned regularly to prevent corro-



Fig. 4

sion and to insure good electrical contact.

The point of maximum efficiency for any carbon trim is just below its maximum rated current carrying capacity. For example, a 12 mm. x 8",

8 mm. x 8" cored projector carbon trim, designed for operation at 21 to 25 amperes, gives best results at an arc current of 24 to 25 amperes. Should a table of current ratings not be available the current carrying capacity of any trim can easily be determined by increasing the current until the arc becomes unstable and the carbons spindle. The current should then be cut back to a point where the arc is steady and the spindling ceases. This is the point of maximum efficiency.

The voltage at the arc is a function of the arc length. If the arc gap is too long the arc will become unsteady and perhaps go out. If too short a so called mushroom point, Figure 5, will be formed on the tip of the negative carbon. The light on the screen, at either extreme, will be seriously

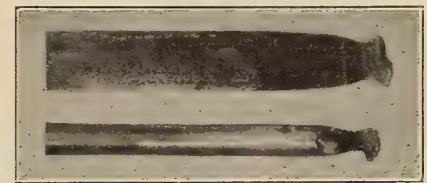


Fig. 5

dimmed. If the voltages shown in the foregoing table are adhered to it will be comparatively easy to establish the proper arc length for most satisfactory operation.

The SRA trims, while of the same diameter as the regular reflecting arc carbons, are of special construction designed for high amperage conditions. Their use provides the theatre with the ultimate in reflecting arc projection as regards current capacity, quantity and quality of light.

### LOW INTENSITY, REFLECTOR ARC—DIRECT CURRENT

Arc Amperage	Arc Voltage	Positive Carbon		Negative Carbon	
10-15	50-60	9 mm. x 8	Cored Projector	6.4 mm. x 8	Solid Projector
16-20	50-60	10 mm. x 8	" "	7 mm. x 8	" "
21-25	50-60	12 mm. x 8	" "	8 mm. x 8	Solid or Cored Projector
26-30	50-60	13 mm. x 8	" "	9 mm. x 8	Cored Projector
31-35	50-60	14 mm. x 8	" "	10 mm. x 8	" "
<b>SUPER REFLECTOR ARC—DIRECT CURRENT</b>					
28-32	52-55	12 mm. x 8	SRA Cored Projector	8 mm. x 8	SRA Cored Projector
32-42	52-55	13 mm. x 8	" " "	8 mm. x 8	" " "

### A Loosely Used Term

It is rather astonishing to note the loose manner in which the term "high intensity" is applied to any and every type of projection arc lamp—presumably as an indication of quality. When it first appeared, the H. I. arc presented such an advance on all existing lamps that it was naturally accepted as the "last word" in projection illuminants. Since then there have been no developments of quite such a revolutionary character and, consequently, the H. I. arc is still looked upon with reverence. Good it most certainly is, but I am not dis-

posed to believe that it possesses such marked superiority over some of the non-H. I. arcs which have recently been perfected as the frequent use of the term "high intensity" to describe these new arcs would suggest.

### What H. I. Means

High intensity is not a term referring to illumination—though this is the interpretation which many seem to put on it. A high intensity lamp is one in which the source of light is not the white-hot tips of the carbons themselves, but a small ball of incandescent gases which is formed at the crater of the positive carbon

from the mineral salts with which the center of that carbon is filled. If this ball of gases kept changing position, correct focussing of the light would be impossible. The only way in which the gas ball can be kept under control is to insure that the positive carbon burns evenly. This can only be achieved by causing it to rotate on its own axis as it is fed forward. An H. I. arc is therefore—strictly speaking—one in which the positive carbon is automatically rotated on its own axis as it is fed forward. It is not an arc giving merely a high intensity illumination.

—A. C. in the Bioscope.



# Systematic Trouble Shooting

By L. W. CONROW

Operating Manager, Electrical Research Products, Inc.

*Trouble shooting is a subject which is always of interest to the projectionist who is dealing with sound. In offering this dissertation on the subject by Mr. L. W. Conrow, THE MOTION PICTURE PROJECTIONIST has the assurance that it is giving its readers the benefit of the knowledge and the experience of a man who knows whereof he speaks. It is, therefore, with great pleasure that we recommend a careful perusal of Mr. Conrow's work.*—THE EDITOR.

A WELL designed and well built sound system will give very little trouble if it is given adequate maintenance and is carefully operated. A notable record of continuous performance is held by a theatre in St. Josephs, Missouri, which opened with a Western Electric Sound system in August 1928 and has never had a shutdown, nor required an emergency call from the Service Engineer since that time.

Regardless of the merits of mechanical or electrical equipment, operation subjects it to wear that in time may make repairs necessary. Fortunately, in the present day sound system of reliable manufacture such

few troubles as are experienced usually develop so gradually that they can be located and eliminated either before or after the show, thus making an interruption a rare occurrence.

When an interruption does occur, however, the projectionist is faced with a situation which calls for prompt action and clear thinking. It is, of course, difficult to concentrate one's efforts on locating and clearing troubles when the audience is impatient and the manager anxious to restore sound. In spite of the urgency the projectionist will in most cases save time by making a careful analysis of the trouble, based on the symptoms, before attempting to clear it. If he guesses at the trouble he may of course be lucky and strike it, but the odds are greatly against him. A few minutes' study of the schematic circuits involved will be likely to accomplish more in a shorter time than any amount of frantic guessing.

## Procedure

The Service Engineer, in clearing a trouble, does not guess or use time-wasting "hit-or-miss" methods. He

first carefully studies the symptoms of the trouble, whether it developed suddenly or gradually and what units and circuits appear to be affected. Based on such considerations he will determine what might cause the symptoms shown. The next step is to make whatever tests may be necessary to determine which of the possible sources of trouble is responsible for the interruption.

Perhaps the most helpful thing in connection with the rapid location and elimination of trouble is the development of such a logical method of attack.

In the two cases of assumed trouble described below, "logical" trouble shooting as practised by the Service Engineer, is outlined. There is no lost motion; sound is restored in the shortest possible time.

## A Simple Case

Assume, for instance, a simple case of trouble in a theatre in which a single stage horn is used. Everything apparently is operating normally in the projection room, when a report is received that the sound in the theatre has stopped.

The Service Engineer, on finding that the monitor horn is operating knows immediately that the trouble cannot be in the amplifiers, sound head, or power supply. It is obvious therefore that it is due to either the stage receiver being defective or to trouble in the circuits leading to it. A simple test with a headset (preferably with terminals having spring clips) will indicate whether the speech circuit is operating satisfactorily at the point where it leaves the projection room. Likewise the power source which supplies exciting current to the receiver can be checked with a voltmeter.

If these are satisfactory the Service Engineer takes the headset, a voltmeter and a spare receiver and goes back-stage. Removing one wire from the speech terminals of the receiver he tests for sound between the loose wire and the other terminal. Assuming that speech is heard, the next step is to make a voltage reading across the exciting winding terminals. If the voltage is normal, the conclusion is that the receiver is defective and must be replaced.

## A Complicated Case

Let us consider a more complicated case of trouble. It is reported that the quality of sound has become "thin" and the volume has dropped considerably. A rapid check of the

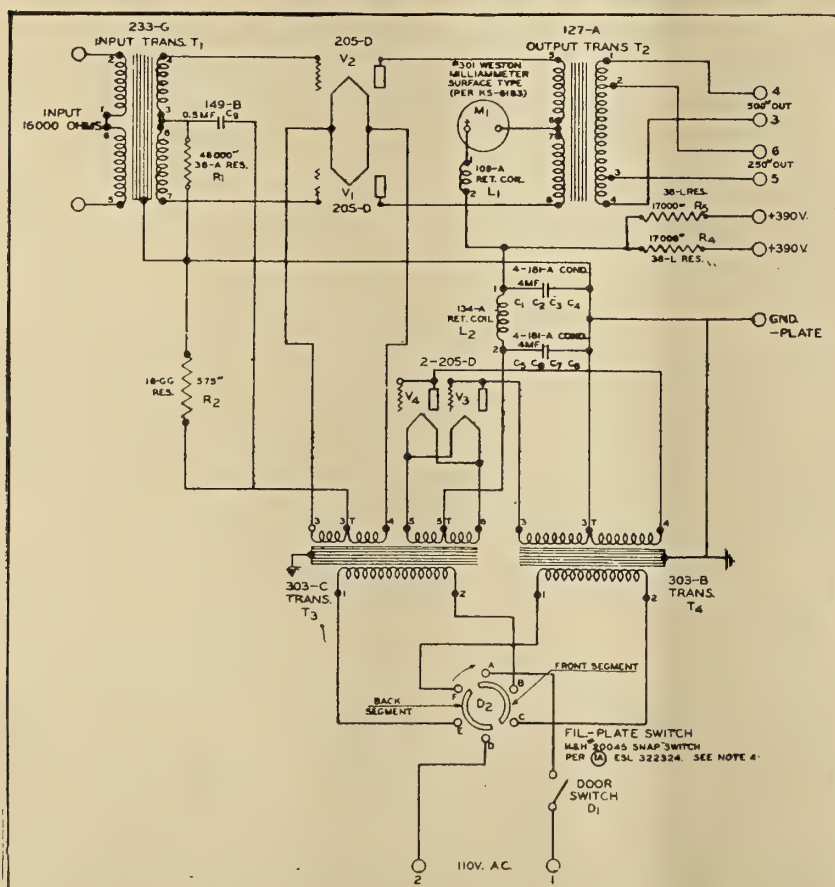


Fig. 1



amplifiers indicates nothing out of the ordinary since all filaments appear to be of normal brilliancy and plate meters show normal readings. A headset is very useful in tracing trouble of this kind.

The first step is to localize the trouble and determine in which piece of apparatus it lies. Proceeding from the input and working toward the output, the Service Engineer first listens across the input to the 41 A amplifier. If speech or music of normal quality and the correct volume for that part of the circuit is heard he knows that the trouble lies beyond this point. A similar test across the secondary terminals (*not* across primary because of plate voltage) of the input transformer of the 42 A amplifier (refer to Fig. 1.) shows conditions at that point to be satisfactory also. However, a test across the output terminals shows conditions similar to those reported. The source of the trouble, then must be in this amplifier.

Since the sound was satisfactory across the "grid" terminals (4-7) of the input transformer it is reasonable to suspect the trouble may be in the output transformer, T-2. Further tests across the various sections (1-2, 2-3, 3-4) of the secondary side of this transformer indicate that sound is normal across sections 1-2 and 3-4 but not across sections 2-3, which obvi-

ously is open-circuited. Temporary repairs are made by utilizing only the good sections until a new transformer can be installed.

#### Systematic Diagnosis

The ability to diagnose systematically and to clear trouble can be developed, for the methods depend solely upon knowledge of the fundamental principles of electricity, familiarity with the sound system circuits and capacity for straight thinking.

The projectionist may well consider what steps he can take to develop this ability and thereby prepare himself to clear trouble in emergencies. The competent projectionist is already entirely familiar with the fundamentals of electricity and with the information contained in the Operating Instruction Book. He should subscribe to and read the current trade magazines which contain articles concerning sound projection. Frequently, especially in the larger cities, he will have the opportunity to attend lectures on subjects of interest. He should study his sound system thoroughly until he is able to trace the power and speech circuits quickly and without too frequent reference to diagrams. If he does not thoroughly understand the circuits the Service Engineer will be glad to review them with him.

## S. M. P. E. to Meet at Swampscott, Mass.

AT a meeting of the Board of Governors of the S. M. P. E., held in the Hotel Van Curler, Schenectady, N. Y., August 10, 1931, the location for the Fall, 1931, meeting was determined and various details pertaining to the meeting were discussed and arranged. Due to the fact that the membership has shown a preference for holding the Fall meeting at a place removed from large metropolitan centers in order to foster and promote the social aspects of the convention, it was decided and arrangements made to hold the convention at Swampscott, Mass., from October 5th to 8th inclusive, with headquarters at the New Ocean House.

Excellent service is assured and plenty of space is available for accommodating the members without crowding. There are a number of golf courses within 25 minutes by automobile, including the Tedesco in Swampscott, the Colonial at Lynnfield, the Homestead at Danvers, the Salem Country Club and the North Shore Club at Salem, the U. S. M. at Beverly, and the Unicorn at Stoneham. On its own grounds the New Ocean House has a modified course of 1,000 yards, with nine holes; also four tennis courts. A baseball diamond and a riding school are near by.

Swampscott is located on the At-

lantic Coast about twelve miles north of Boston, in the center of a location full of points of historic interest such as Lexington, Concord, Salem, Gloucester, Marblehead, Plymouth, and Cambridge. It may be reached very conveniently by rail from all points or by boat from New York and other points on the Atlantic seaboard.

#### Transportation Facilities

How to reach Swampscott by train: With the exception of the Minuteman from Chicago, trains from points south and west of Boston arrive at the South Station. Trains from points north of Boston, as well as The Minuteman, arrive at the North Station. It is necessary for guests arriving at the South Station to cross the city. Best methods are by taxi or elevated trains. Time about five minutes. Elevated trains run every three minutes. Taxis always available.

All trains for Swampscott leave Boston from the North Station. Lynn, the station just preceding Swampscott from Boston is used quite generally by guests of the New Ocean House. There are twenty-four trains from Boston to Swampscott daily, and twice that number from Boston to Lynn. From Lynn, there is excellent taxi and trolley car service. Trolley cars marked "Swamps-

cott", "Beach Bluff", or "Marblehead" come direct to the grounds of the New Ocean House. Taxis meet all late trains at Lynn and Swampscott.

How to reach Swampscott by automobile from Boston: The following are the directions to reach the New Ocean House from Commonwealth Avenue and the Public Garden in Boston:

Turn left from Commonwealth Avenue on Arlington Street. Turn right from Arlington Street at Beacon Street. Turn left from Beacon Street into Charles Street. Follow Charles Street to end, turn left. Follow Route 1A to Lynn. Turn right at Washington Street to Lynn Shore Drive. Follow waterfront to New Ocean House.

#### Sightseeing Facilities

Motor coaches with individual parlor car seats are available for sightseeing purposes. The average cost for two to four-hour trips is \$2.00 to \$2.50 per passenger.

Trip to Salem, stopping at all the historical points of interest, including the House of Seven Gables, Olde Witche House, Ropes Memorial and Gallows Hill, returning by way of Marblehead, visiting points of interest there, including the original of the great painting, "Spirit of '76." Charge, \$2.00 per person. Time, 3 to 4 hours.

Trip to Gloucester, by North Shore route, through Beverly, Beverly Farms, Magnolia (including shopping district), and the fisheries in Gloucester. Charge, \$2.50. Time, 4 hours.

Motor coaches are also available for Boston trains and golf courses.

A preliminary program of the meeting is being arranged by the Convention Committee, which will be mailed to the membership in the near future, and an attractive program of papers is being arranged by the Papers Committee. An exhibition of newly developed motion picture apparatus, conducted along lines similar to the exhibition held at the recent Hollywood meeting, will be held in the Colonial Room of the hotel.

## DeForest to Replace 1,000 Equipments in Six Months

General Talking Pictures, under its new replacement plan, contemplates the installation of approximately 1,000 new DeForest equipments during the next half year. The replacement plan, which embraces the substitution of modern equipment in place of apparatus at present in their theatres, is being offered to the exhibitors under a rebate arrangement. It is stated that some forty replacements have been effected since the recent inauguration of the plan.



# Acoustics of a Flexible Space Theatre

By CARL W. MEYER

The accompanying article from the pen of Carl W. Meyer, Staff Acoustical Engineer, Johns-Manville Corporation, describes a series of exhaustive acoustical analyses conducted to determine the nature and the extent of the acoustical treatment which will be required in the proposed Ukrainian National Theatre. This new Soviet theatre will be unique of its kind, in that it contemplates a flexibility never before attempted in theatre design. The stage and the auditorium are to be so constructed that the theatre may be instantly transformed by means of a central control, into a concert hall, an opera or legitimate stage, a multiple stage, a space theatre, a congress hall, etc. Models of the theatre were prepared for the purpose of acoustical analysis.—THE EDITOR.

**G**OOD acoustics in theatres and auditoriums must not be a matter of chance, but may be designed as infallibly as any other architectural composition. If the ultimate in audition is to be attained, several interrelated acoustical requirements must be simultaneously considered.

Fig. 1. Concert Hall: Volume 1,326,000 cu. ft.

Reverberation Characteristics	
Empty .....	2.46 seconds
Half Audience plus 150 Musicians ...	2.11 seconds
Maximum Audience plus 150 Musicians	1.9 seconds

First, all surfaces and contours should be such as to eliminate the possibility of echoes, interfering reflections, and concentrations of sound.

In the second place, contours and surfaces should be arranged to reinforce the direct sound with reflected sound, particularly in the distant portions of the theatre—thus assuring a uniform and adequate loudness distribution.

Finally, the total sound absorbing capacity of the room should be so related to the volume that the requisite reverberation time will result.

In the proposed Ukrainian National Theatre, the problem was not merely to provide satisfactory acoustics in one auditorium, but rather to produce good audition in six auditoriums of different volumes, into which the original may be transformed. Changes in stage arrangement, and use to which the theatre is put, necessitate widely varying acoustical conditions. Consequently the acoustics were required to be exceedingly flexible so that the proper acoustical setting might result in each case.

## Method of Analysis

To facilitate the study of contours in the Ukrainian National Theatre project, echo-analysis photographs were made, according to the method devised by R. F. Norris of the C. F. Burgess Laboratories, Madison, Wisconsin. This method is based on the fact that light and sound follow the same law of reflection, namely, the angle of reflection is equal to the angle of incidence. It is a relatively simple matter to substitute a light for the sound source and then take photo-

is technically termed "reverberation," and its computation in seconds is possible through use of the following formula:

$$T = \frac{.0083 V}{a} (9.1 - \log a)$$

This formula is derived for English units and is useful when the volume "V" (in cu. ft.) and total absorbing power "a" of the room under consideration are known. If the reverberation time is too great, the merging of the successive sounds blur the fine effects of music and prevent the clear understanding of speech. If it is too small, the effect is to produce dullness and loss of tone quality.

The degree of reverberation which is desirable depends largely upon the purpose for which the theatre or auditorium is to be used. In a theatre to be used solely for music, it is desirable to have a higher period of reverberation than for a theatre of the same volume to be used for speech. This is true because music permits more overlapping of sounds before it becomes distorted, and also because



graphs of various sections of the theatre model in order to see what might be expected in the way of echoes and sound concentrations, and to observe the effectiveness of sound reinforcement in the distant portions of the auditorium.

To study the reverberation characteristics a mathematical analysis was made which was predicated upon the researches of the late Prof. Wallace C. Sabine of Harvard University. The prolongation of sound in a room after the source has ceased sounding

an auditorium bordering on the brilliant often enhances the richness of a musical program.

## Sound Distribution

In order to facilitate the study of the distribution of the reflected sound and the matter of undesirable concentrations and reflections, references may be made to the echo-analysis photographs of the plan and various sections. In taking these photographs the light source was placed in positions eventually to be occupied by

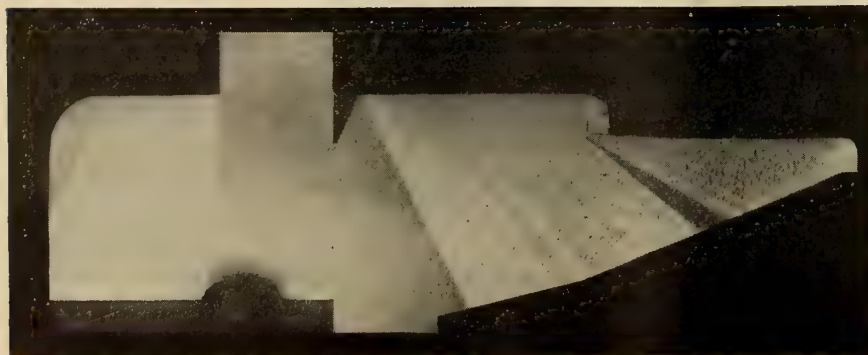


Fig. 2. Opera: Volume 1,100,000 cu. ft.

Reverberation Characteristics	
Empty .....	2.12 seconds
Half Audience .....	1.85 seconds
Maximum Audience	1.67 seconds



**Fig. 3. Multiple Stage Playhouse:**

<i>Volume 1,100,000 cu. ft.</i>	
<i>Reverberation Characteristics</i>	
<i>Empty .....</i>	<i>2.12 seconds</i>
<i>Half Audience ....</i>	<i>1.85 seconds</i>
<i>Maximum Audience</i>	<i>1.67 seconds</i>

sound sources. When studying these photographs, one must bear in mind that only the path of the first reflection has been recorded. Actually, sound is reflected from surface to surface many times before it finally becomes audible. It is also to be noted that the initial sound wave has spread directly to all portions of the theatre, and hence some of the darker portions of the photographs do not indicate a total absence of sound. The reason for making such a detailed analysis of the first reflection is because it is this reflection which usually causes the most trouble in the form of echoes and sound concentrations.

Figure A and B represent plan

view conditions and making possible the use of an architectural shape or contour which would otherwise be conducive to poor acoustics.

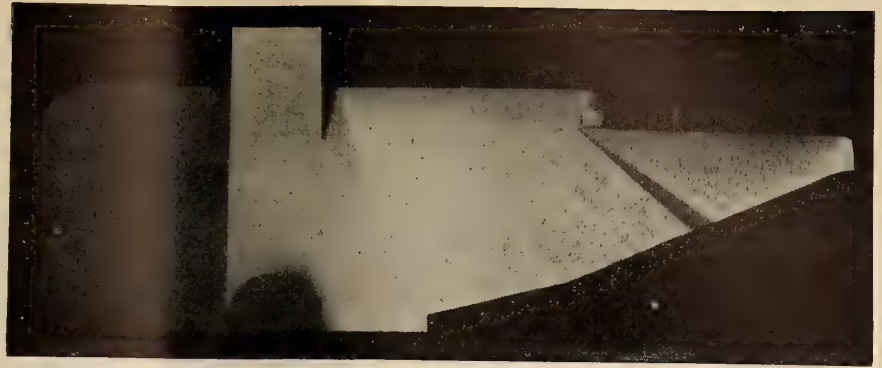
#### General Sound Distribution

Figures 1 and 6 show the distribution of reflected sound in the longitudinal section of the various forms to be assumed by the auditorium. Since the differences between the various arrangements lie chiefly in the stage, the general nature of the sound distribution in the several instances can be discussed together.

It is immediately apparent that the reflected light rays show excellent sound distribution, and that a uni-

the concentrating effect which such a surface has upon the sound reflected from it. This, of course, depends upon the position of the sound source with reference to the cyclorama. In this auditorium the relative positions of the cyclorama and sound sources in the various sections, as well as the curvatures of the cyclorama itself, were so planned to obviate this difficulty and permit an architectural effect which only the use of a cyclorama makes possible.

The stage flies, drops and sets break up the smooth unbroken nature of the cyclorama, and, since it is to be constructed of perforated sheet alumin-

**Fig. 4. Space Theatre: Volume 1,632,000 cu. ft.**

<i>Reverberation Characteristics</i>	
<i>Empty .....</i>	<i>2.39 seconds</i>
<i>Half Audience ....</i>	<i>2.16 seconds</i>
<i>Maximum Audience</i>	<i>1.98 seconds</i>

views of the auditorium and show the distribution of reflected sound before and after the rear wall was treated acoustically. It was architecturally necessary that the rear wall follow the curvature shown, and Photograph A indicates how effectively such a surface can concentrate the reflected sound back on the source and produce an echo in the front portion of the auditorium.

To secure the best reverberation time a corrective sound-absorbing treatment was applied to the back wall with the result noted in Photograph B. In this way the acoustical material was made to serve the dual purposes of providing for ideal rever-

beration conditions and making possible the use of an architectural shape or contour which would otherwise be conducive to poor acoustics.

To obtain the effect of acoustical treatment on the rear wall, it was painted black before taking the photographs. Without the acoustical treatment the rear wall was causing reflections which would undoubtedly have been echoes.

In most cases the use of a curved cyclorama on the stage causes rather strange acoustical phenomena due to

um, it can be considered practically non-reflecting.

#### Reverberation Characteristics

The periods of reverberation of the Concert Hall as outlined in Figure 1 are all that could be desired. They are slightly higher than those of the Opera and Play House as shown in Figures 2 and 3. This, however, is to be desired. The volume of the auditorium is 226,000 cu. ft. greater in the case of the Concert Hall and this necessitates a longer period of reverberation in order to obtain an adequate loudness level throughout the auditorium. Then, too, its use is

**Fig. 5. Congress Hall: 1,632,000 cu. ft.**

<i>Reverberation Characteristics</i>	
<i>Empty .....</i>	<i>2.39 seconds</i>
<i>Half Audience plus</i>	
<i>1,000 Delegates ..</i>	<i>1.84 seconds</i>
<i>Maximum Audience</i>	
<i>plus 1,000 Dele-</i>	
<i>gates .....</i>	<i>1.7 seconds</i>

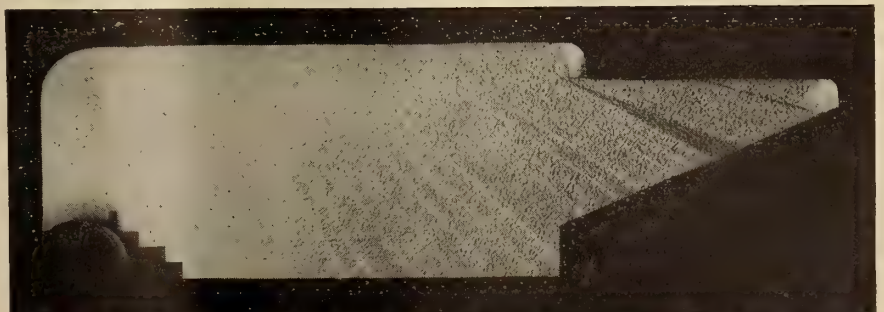
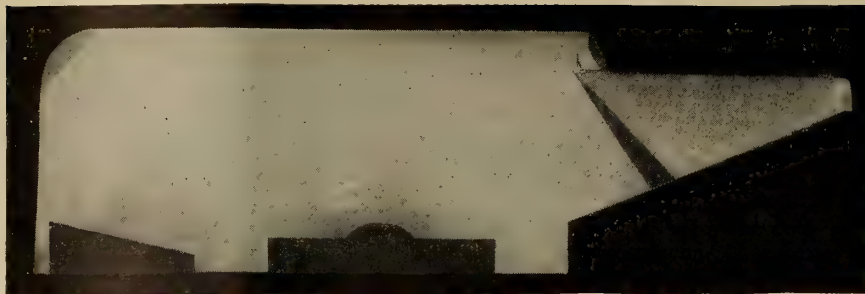




Fig. 6. Circus: Volume 1,632,000 cu. ft.

**Reverberation Characteristics**

Empty .....	2.39 seconds
Half Audience ....	2.16 seconds
Maximum Audience	1.98 seconds



solely for music which is best rendered in a more reverberant room. Hence, the higher periods are necessary.

Since the volume of the Convention Hall is increased another 306,000 cu. ft. over that of Figure 1, the periods of reverberation as at first computed, were too high to be acceptable—especially as the major use of this auditorium would be for speech. The excessive reverberation was not as great as one might expect, however, because the audience is also increased by 1,000 persons—an excellent form of acoustical treatment. By introducing 5,000 more units of absorption in addition to the increase in audience, it was therefore possible to arrive at acceptable periods.

The most effective location for applying this additional acoustical treatment was found to be on the side walls extending from the stage-opening in both directions to the rear wall. This, however, did not entirely solve the problem. Should this amount of acoustical treatment be installed and the auditorium used, for example, as a Concert Hall, the loudness might be impaired and the music made to seem dull and lifeless. Therefore, it was necessary to devise a means whereby this additional treatment could be made effective or ineffective on very short notice. To accomplish this, the acoustical material was built directly into the specified wall areas and covered with mechanically operated

louvers. It is only a matter of throwing a switch to change the acoustical properties of the auditoriums and true flexibility for all conditions is thus obtained.

In the Circus and Space Theatre, Figures 6 and 4, the reverberation periods, while not as low as for the Convention Hall, are very satisfactory. There is an increase in reverberation which results from the fact that the 1,000 persons are no longer present as effective acoustical material.

**Two Auditoriums Possible**

By lowering the proscenium curtain to the theatre floor and rotating the 1,000 movable seats to the area normally occupied by the turntable stage, it is possible to form two distinct auditoriums. The smaller one would have a seating capacity of 1,000 persons and the larger one of 3,200 persons. The exceptional acoustical qualities of the larger auditorium have already been proved, as in Figures 2 and 3, and computation shows that the reverberation characteristics of the smaller one are conducive to perfect hearing.

Although the reverberation studies were made for the empty house, half audience and maximum audience conditions, it is believed that the average audience will be more in the neighborhood of the maximum capacity, because the theatre is an enterprise

controlled and financed by the State, with free admission.

It is interesting to note the small spread in reverberation from the empty to the maximum audience conditions, which shows that the reverberation characteristics of the auditorium are independent of the size of the audience. This is due largely to the use of specially-designed fireproof theatre chairs having exceptionally large sound-absorbing capacity. The net acoustical effect is thus the same as though a relatively large audience is always present, because each vacant seat absorbs about as much sound as a person.

In regard to the nature of the sound absorbing material used in effecting the necessary corrections, some explanation is necessary. With the advent of radio broadcasting and the sound films, the extent to which acoustical materials absorb sounds of different frequencies has been given serious consideration. It has been found desirable that the corrective materials have a "straight line" absorption characteristic—i. e., they should absorb all frequencies over the essential portions of the scale of pitch to very nearly the same degree.

Most acoustical materials, and those sound absorbing mediums normally present in the theatre, as audience, seats, carpets and drapes, are good high frequency absorbers, but their absorption at the lower frequencies is poor. This results in the selective absorption of the higher frequencies, which frequencies give quality and intelligibility to speech and music, and, consequently, their literal filtering out causes the sound to be distorted and seem unnatural. This unbalanced absorption is also, in a great measure, responsible for the dullness and loss in tone quality previously mentioned.

The absorption characteristics of the sound absorbing mediums normally present in the theatre are beyond control. However, the characteristics of the acoustical material to be introduced as a corrective are controllable. In this case the installation of an acoustical treatment, consisting of Rock Wool, four inches thick, and finished with perforated metal, was recommended. This is the best "straight line" sound absorbing treatment known, and is recognized by the leading broadcasting systems

(Concluded on page 30)



Fig. A. Plan of auditorium before acoustical treatment



# Some Aspects of Loudspeaker Development

By W. L. WOOLF†

*In this series of articles on the subject of Loudspeaker Development, Mr. Woolf purposes to trace the history and the development of the loudspeaker from its primitive form to the complex reproducing units in use at the present day. As the story progresses, it will disclose the origin of the various types of speakers and describe the manner in which they have contributed to the advancement of the reproduction of sound. The series promises to be of absorbing interest, and should prove of value to the projectionist in enabling him to obtain a better understanding and appreciation of the problems involved in the design and construction of loudspeaker equipment.—EDITOR.*

VARIOUS definitions have been given for the phenomenon known as sound. It has sometimes been defined as an audio sensation in the human ear. Naturally, such a definition requires a person to be located in the vibrating air before sound can exist. Probably a definition as accurate and as serviceable as any is that sound is a series of vibrations of the air of such frequency, or pitch that it is audible to the human ear. For example, the thump of a drum stick on the taut diaphragm of a drum, causes the diaphragm to vibrate. This vibration produces an alternate compression and rarification of the air surrounding the drum head. These alternate variations in air pressure travel outward and upon reaching the ear, are interpreted as sound.

If now, we remove the drum, but find some means of continuing the variation in air pressure, or of creating others identical with those which the drum produced, the ear hears the same sound as before.

## The Purpose of the Speaker

The purpose of the loudspeaker is to create sound waves similar to those created by the original source of the sound to be reproduced. If the re-created sound waves were only identical with the original ones in frequency, intensity and wave form, the loudspeaker would be perfect. It fails in attaining this perfection in the difference between the waves which it creates and the waves produced by the original source of the sound.

In either the horn or the cone type of speaker, the principal member is a vibrating membrane, just as the taut drum head is the principal member of a drum. In the case of a drum, vibration of the membrane is caused by the percussions of the drum stick. Vibration of the membrane or diaphragm of a loudspeaker, however, is

produced by the action of an electric motor.

The design of loudspeakers has much to do with:

- (1) The kind of vibrator or membrane selected,
- (2) The kind of motor selected to drive the vibrator, and
- (3) The connecting link between the vibrator and the air.

It is immediately apparent that there must be a connecting member between the motor and the vibrator. We shall later investigate the importance of the means for connecting the vibrator to the air, for the vibrator must get a good grip on the surrounding air in order that the energy of its vibrations may be transferred efficiently into vibrations in the air, for after all it is the vibrations in the air which are the end sought. The vibrations of the diaphragm are only a means to this end. The connection link between the diaphragm and the air lies in the sound chamber and the horn.

We shall now consider successively various types of motors, diaphragms

and sound chambers in order to determine in what manner the various investigators and inventors have met the problems presented, and trace some features of the art to its present state of development.

## Loudspeaker Motors

The human ear is capable of hearing sound impulses varying in frequency from those which recur at the rate of twenty per second to those which recur at the rate of from ten to twelve thousand per second. It is difficult to place an arbitrary limit on this range of audibility. For the average person of normal hearing, the range lies between approximately twenty-five and nine thousand cycles.

A perfect loudspeaker should be capable of faithfully reproducing all frequencies from the lowest to the uppermost range of the human ear. In the present state of the development of sound reproduction, however, such a speaker may prove more of an embarrassment than a treasure, because due to its sensitivity and high frequency range, it would reproduce imperfections originating in the apparatus preceding the loudspeaker in the circuit. There are good reasons, however, why a speaker should reproduce with uniform efficiency all frequencies from 85 to 8500 cycles. Even comparatively simple sounds are composed of a combination of several frequencies, and more complex sounds such as those produced during the rendition of an orchestral selection involve the simultaneous reproduction of a very great number of waves of different frequencies.

While the low notes of a complex sound are reproduced by comparatively long and slow movements of the vibrator or diaphragm, the high notes are reproduced by smaller motions super-imposed upon the longer ones. A loudspeaker motor which will reproduce all frequencies simultaneously must of necessity be extremely sensitive, and its moving parts must be very light as compared with the electrical driving force.

One of the oldest and simplest types of loudspeaker motors consisted of a soft iron core surrounded by a coil. The end of the core was spaced a few thousandths of an inch from the center of an iron diaphragm. Electrical currents passing through the coil alternately magnetized and demagnetized the core. Variations in the magnetic field acting upon the diaphragm set up vibrations in it, these vibrations being in turn transmitted to the air. An improvement in this form of motor consisted in adding a second core. These two

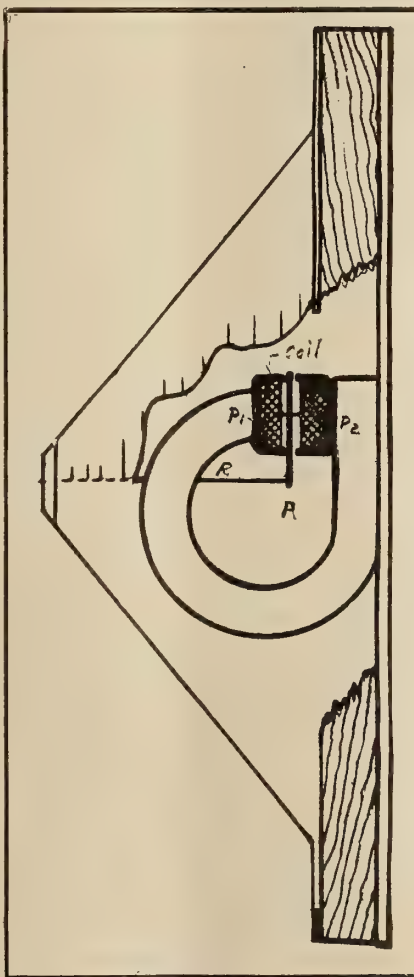


Fig. 1

†Amplion Products Corp.



cores were connected together by means of a permanent magnet. The voice coil was then split into two parts, one half of it being on each core. With this method, a given electrical impulse is able to create a greater difference in magnetic pull and thus increase the efficiency of the motor.

The weakness in both of these types of motor was the necessity of using iron or magnetic diaphragms. The great weight of such diaphragms prevented vibration at high frequencies. While both forms, particularly the latter, are still in use in tele-

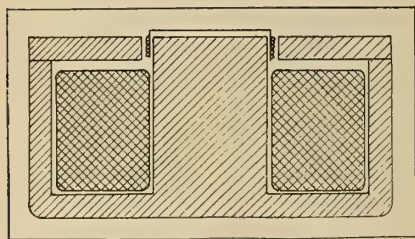


Fig. 2

phones, the motor's limitations, especially in reproducing the higher frequencies, precludes its use in radio, theatre and public address systems.

#### The Balanced Armature Type

An improvement in the bipolar unit was realized in the balanced armature type of reproducer motor. In this form of motor, (See Fig. 1) a comparatively light, soft iron armature "A" vibrates between two pole pieces P<sub>1</sub> and P<sub>2</sub>. The vibration of the armature is transmitted to a cone or diaphragm by means of a light metal rod "R." A motor of this type, in addition to offering greater efficiency, permits the added advantage of using a non-magnet cone or dia-

phragm. The designer is thus at liberty to select from a variety of materials for the cone or diaphragm and accordingly avail himself of that substance which he considers best suited for the purpose.

The armature type of motor was introduced by Baldwin in the famous Baldwin headset. It is employed in practically all magnetic cone speakers and in the majority of the magnetic type air column units. Its limitations lie in the distance through which the armature may vibrate between the pole pieces without striking them. If the distance between the pole pieces is increased, the flux-density decreases. If the distance between the pole pieces is decreased, the flux-density is increased, with a corresponding increase in the sensitivity of the unit. The distance through which the armature may move without striking the pole pieces, however, is decreased limiting reproduction, particularly in the lower register.

#### The Electro-Dynamic Unit

In 1898, Sir Olived Lodge took out a patent on the loudspeaker motor which is known today as the electro-dynamic type of unit (See Fig 2). So carefully thought out was this inventor's model, that it is the most popular type of loudspeaker motor used today, and strange to say it remains practically unchanged from the form introduced by Mr. Lodge thirty-three years ago. In this form of speaker motor, an iron bowl is filled with a copper coil. The magnetic circuit is completed by means of a top plate. A gap is provided between the top of the core and the plate, and it is in this gap that is placed the voice coil which operates the diaphragm.

(To be continued)

## Projection Room Planning\*

The article which follows is an abstract from the report of the Projection Practice Committee of the S. M. P. E. The Chairman of the Committee is Harry Rubin. Members of the sub-committee which drafted the report, of which the accompanying article is an excerpt, are: J. H. Goldberg, Chairman; Lester Isaac, J. J. Hopkins, R. Miehl, and L. M. Townsend.—EDITOR.

THE following recommendations have been adopted, after an exhaustive study, by the entire committee and are submitted for adoption as standards. In following them the local code should in all cases be consulted for deviations from these standards. It is the aim of the Committee to bring them before the various agencies for revision and adoption. Three layouts have been

adopted, marked A, B, and C, which were planned for flexibility, simplified construction, ease of operation, etc., to be selected according to the size of theatre and type of operation. The key to the symbols used on the plans is shown in Fig. 1, and one of the three plans is shown in Fig. 2.

(1) *Projector Spacing*.—The distance between projectors shall be not less than 4½ feet nor more than 5 feet, measured between lens centers; for projection distances less than 100 feet, the spacing shall be 4 feet. When two projectors are used, they shall be equally spaced on either side of the center line of the auditorium. When three projectors are used, the center projector shall be placed on the center line of the auditorium.

(2) *Observation Ports*.—Observation ports shall be 12 inches wide and 14 inches high and the distance from the floor to the bottom of the

openings shall be 48 inches. The bottom of the opening shall be splayed 15 degrees downward. In cases where the thickness of the projection room wall exceeds 12 inches, each side shall be splayed 15 degrees.

(3) *Projector Ports*.—Projector ports shall be 10 inches wide and 12 inches high (see Fig. 3). The bottom and sides of the openings shall be splayed in the same manner as observation ports. The distance from the floor to the bottom of the openings shall be in accordance with the table of projection angles as given in the accompanying plans for the layout of the projection room.

(4) *Other Openings*.—All other openings, such as those intended for effect projectors, double dissolvers or single spot lamps shall be 24 inches wide and 34 inches high. The distance from the floor to the bottom of the openings shall be 26 inches when the angle of projection is not greater than 20 degrees. For projection angles greater than 20 degrees, one inch shall be deducted from this value for each degree in excess of 20. The minimum spacing allowed between these openings shall be as shown on the plans for the projection room layout. The placing of these openings to the right or left of the projectors shall be optional and according to conditions.

(5) *Dimensions of Projection Room*.—The projection room shall have a minimum height of 10 feet and a maximum of 12 feet. The minimum depth of the room shall be 12 feet. The length of the projection room shall be governed by the amount and type of equipment, as shown on the plans. Consideration should always be given for probable future needs.

(6) *Front Wall*.—In all cases, the inside surface of the front wall of the projection room shall be smooth and without structural projections. Care shall be exercised in locating the hanging rods and columns in the front wall so as not to interfere with the proper location of the various openings.

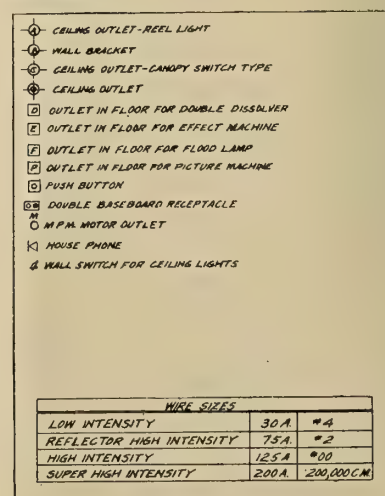


Fig. 1

\*Presented at the Spring, 1931, Meeting of the S. M. P. E. at Hollywood, Calif. Reprinted through courtesy of the Society Journal.



(7) *Conduits.*—These shall in all cases be concealed, and all boxes shall be of the flush-mounting type.

(8) *Projection Arc Conduit.*—The size of conduits for projection arcs shall be as indicated on the plans. These sizes anticipate the need for future increased capacity, and should be adhered to in order to provide space for pulling in larger wires as needed.

(9) *Conduit for Sound Equipment.*—Conduit for sound equipment shall conform with the type of sound equipment to be installed. The manufacturers of such equipment should be consulted with regard to the proper layout of the sound system before proceeding with the installation.

(10) *Projection Room Lighting.*—An individual ceiling fixture with canopy switch shall be installed for each piece of equipment, and shall be placed in line parallel to the front wall at a distance not less than 18 inches or more than 24 inches from the front wall. The outlet connected to the emergency lighting system shall be located in the ceiling midway between the extreme ends of the projection room, and 4 feet from the back wall. Small projection rooms shall be equipped with one reel light and large projection rooms with 2 such lights conveniently located.

(11) *Ventilation.*—A separate exhaust system of ample capacity shall be provided for the projection room and other adjacent rooms provided for projection equipment. All projection arcs, and arcs of other equipment as required, shall be connected into the ducts of the exhaust system, which should contain a blower type exhaust fan. There should also be a gravity vent in the main projection

room, rheostat room, generator room, and sound equipment room, leading directly through the roof. The minimum size shall be 12 by 18 inches, maximum size 18 by 24 inches. They shall also be equipped with swivel cowls. A supply of fresh air shall be brought into the projection room, preferably at the floor level and at the extreme ends of the room, and shall be baffled to prevent direct drafts. In cases where the theatre is equipped with a refrigerating system, the projection room system should be connected into the main duct of this system. A fan shall be provided of sufficient capacity to remove all smoke and gas in case of fire, and this fan should be so connected to the port shutter controls that its full capacity will be automatically made available upon dropping of the shutters.

(12) *Extra Rooms.*—A separate room shall be provided solely for the rheostat equipment. This room shall be provided with ventilating means as previously set forth. An additional and separate room, properly ventilated, shall be provided for the sound equipment.

(13) *Toilet and Wash Room.*—Hot and cold water and other toilet facilities shall be installed and located convenient to the projection room. Suitable space shall also be provided for clothes lockers.

(14) *D-C. Supply for Arcs.*—Two generators or other sources of direct current shall be installed to insure continuous operation in case of breakdown.

(15) *Location of Arc Generators.*—Arc generators may be located in a room adjacent to the projection room, and the responsibility for their maintenance delegated to a projectionist.

Where the generators are large, making it necessary to reinforce the structure carrying them, they may be placed in the basement, provided proper maintenance is assured. Where the generators are placed near the projection room, this room shall be sound-proofed and the foundation for the generator arranged to thoroughly eliminate the noise and vibration of the generator.

(16) *Projection Port Shutters.*—(See Fig. 3.) These shall be constructed of not less than 16 gauge iron guides built up of iron flats, 2 inches wide and  $\frac{1}{8}$  inch thick, with spacers 1 inch wide and  $\frac{1}{4}$  inch thick for the shutter to slide in. The shutter shall be made of not less than 10 gauge iron, provided with leather bumpers on sill at the bottom to take up the shock when the shutter drops. Each port shutter shall be connected to a master rod by a string and ring attached to a pin on a master rod. The master rod is to be fastened securely to the front wall, approximately 18 inches below the ceiling. It should be provided with a sufficient number of bearings properly aligned to assure smooth operation, connected through pulleys and fusible links located over each projector and capable of being controlled at the exit so that it may instantly be tripped. All large openings in addition to the above shall be provided with an individual approved counterweight (see Fig. 4) which will permit the shutters to be easily opened and shall be controlled by the master rod. All observation ports shall be provided with metal guides to receive  $\frac{1}{4}$ -inch clear glass, this glass to be at an angle opposite to the projection angle and arranged to be easily removed for cleaning.

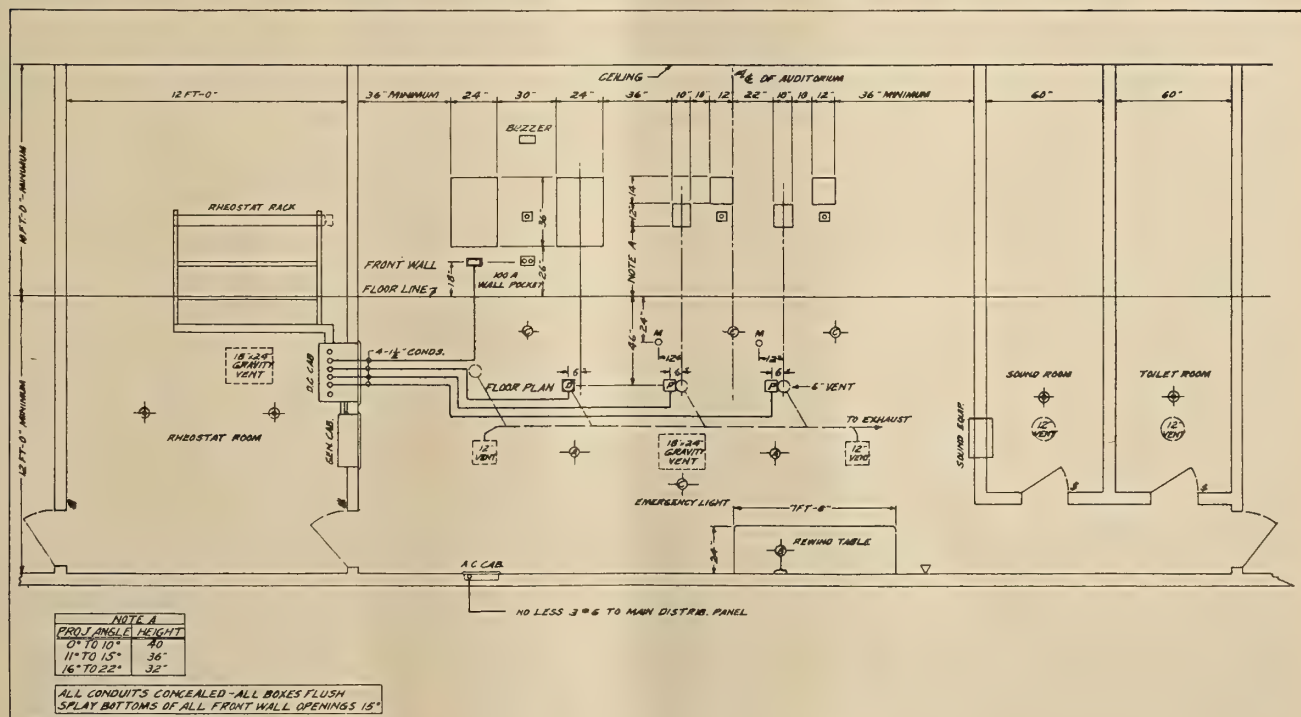


Fig. 2







the material presented here shall encroach upon the activities of the Progress Committee although there may unavoidably be some slight duplication.

Neither the Committee nor the Society now has facilities to carry on investigations, but it can recommend what is of importance for further progress in the art. The Committee, therefore, feels it may be of considerable service in presenting to the Society and to the industry matters on which work should be done. Some of the items which have been suggested to the Committee as worthy of consideration have already received sufficient study to permit the formation of definite recommendations. In these cases, arguments for and against are presented and the Committee's conclusions submitted.

#### Directional Sound Detectors

A directional sound detector comprises a device in which the efficiency of response is a function of the angle between the direction of incident sound and a reference axis in the system which coincides with the direction from which it is desired to receive the sound.

In general, there are two principles used in directional sound detectors, one amplifies the sounds desired by concentrating them and the other avoids or suppresses the unwanted sounds. Horn and reflector types employ both principles. The ribbon microphone and absorptive baffle make use of only the second.

#### Horns and Reflectors

Horns have been long used in conjunction with various types of sound reception apparatus, but have not been used for high-quality pick-up due to the difficulty of obtaining a good frequency characteristic in spite of the apparent efficiency of this type of unit.

The use of reflectors for the reception and focusing of sound is well known. In order to receive sound pressure variations over a wide frequency range, it is necessary to use a reflector having large dimensions. Within practical limits of size, a reflector is likely to have a characteristic which will be better at the high end of the frequency scale than at the low end, although compensation for this effect can be applied.

#### Combination Horn and Reflector

It is possible to combine the horn and reflector principles in a device which has a fairly good resultant frequency response. The directional properties, however, as limited by the design of a horn and a reflector, may not be uniform with frequency.

The directional characteristics of these devices have been found useful in eliminating undesired sounds and

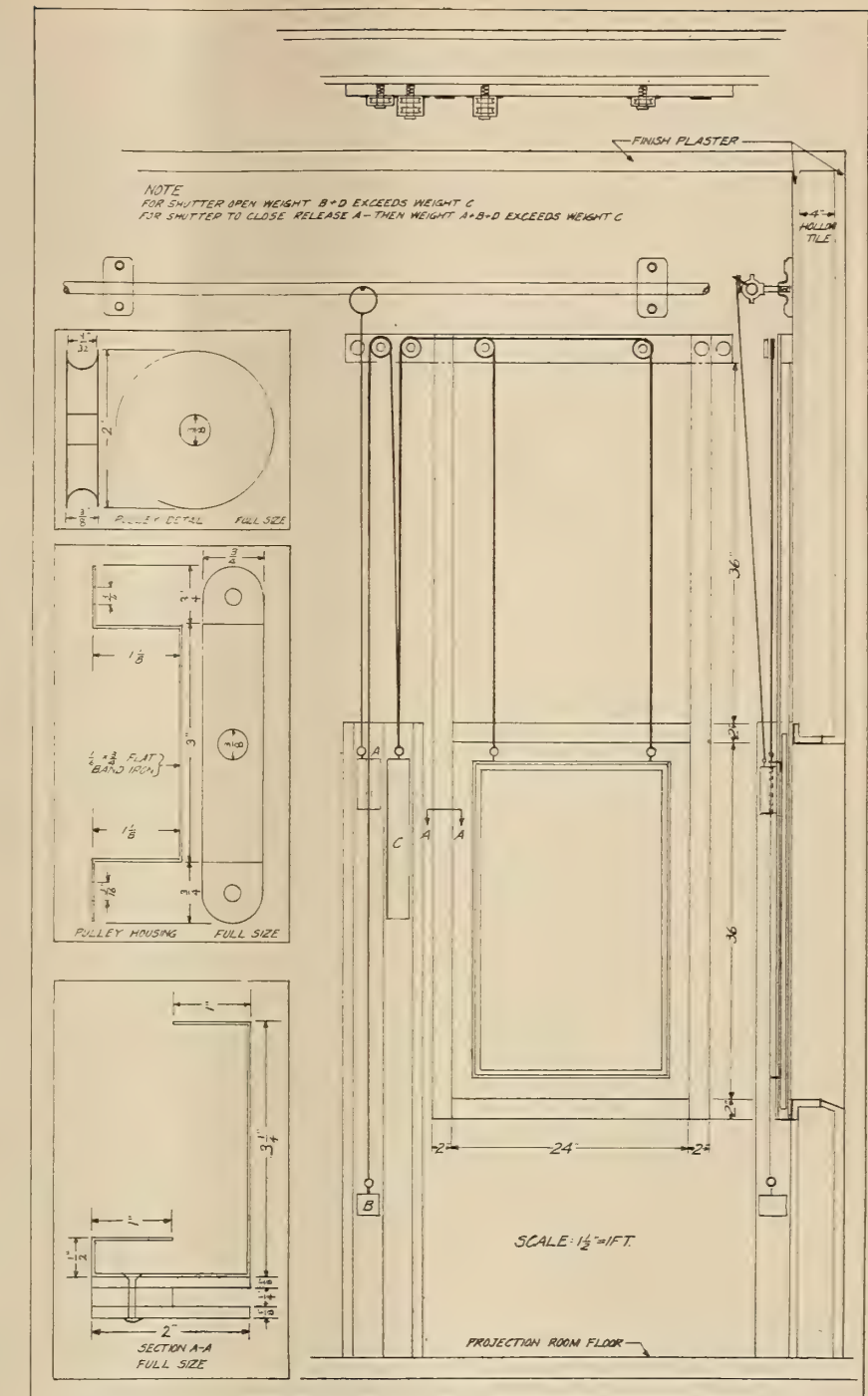


Fig. 4

noises, particularly where the sound which it is desired to pick up is weak. The effectiveness has been greater for outdoor work where there is no reflected sound than for use in studios where reverberation is encountered.

#### Ribbon Microphone and Baffle

A properly designed ribbon microphone may be made very directional. Its directional characteristic is practically independent of frequency because of its dimensions, and, by virtue of its directional effect, increases the distance from which acceptable sound may be picked up, in spite of the fact that it receives a relatively small amount of energy due to its size. It is also particularly effective

in reducing unwanted sounds, such as camera noises and the like.

It has been found possible to design an absorptive baffle for a microphone in such a way that any sound coming from a direction not included in the throat angle of this absorptive structure will reach the diaphragm at a very much reduced intensity. This structure, while fairly large in dimensions in order to obtain the necessary absorption, is not dependent entirely upon the wave-length of the lowest frequency for its minimum dimension since the wave front remains practically undisturbed. This arrangement, of course, is no more efficient than the microphone would

(Continued on page 23)



# Outline of Sound Recording

By GEORGE DOBSON†

*In presenting to its readers the series of articles by Mr. George Dobson on the subject of Sound Recording, beginning in this issue, THE MOTION PICTURE PROJECTIONIST believes that it is supplying to those whose daily duties include the operation of sound motion picture equipment, a means of securing authoritative first-hand information on a subject which has a direct bearing on their work. An intelligent and comprehensive knowledge of sound recording will undoubtedly contribute much to the more efficient operation of the equipment used in its reproduction.—THE EDITOR.*

**W**ITH the many transformations which occur from the time sound is originally produced in a recording studio until the sound is reproduced in a motion picture theatre, the marvel is not that sometimes we have bad sound, but that the sound is so consistently good. Should anyone doubt this statement it is suggested that he drag out his prewar phonograph and records or attempt to remember how unnatural the average actor's voice sounds in even a small size theatre or that he listen to some political orator talking from the back of a train or in a large auditorium. After listening to one of these he may then listen to almost any motion picture play, properly reproduced of course, and marvel how nat-

†Commercial Engineering Dept., Electrical Research Products, Inc.

ural it seems and how much the players have ceased to be actors and how nearly they seem to be like ordinary people speaking as they would in real life.

In order that such results be achieved an enormous amount of detail work must be done by many people starting with the players and their directors and ending with the motion picture projectionist.

## Improvements in Technique

Since the day of the "Jazz Singer" four years ago, many improvements have been made in the technique of recording, many changes have been made in the apparatus used and the artist and directors have ceased to feel that they are so shackled with the "mike" and other recording equipment that they cannot do their best work. However, despite the many detail changes and the many improvements in technique, the principles of recording remain the same as they were at the start.

While these principles have been thoroughly described in many technical papers and some of them mentioned in more popular papers, it has been suggested that many might be interested in having a summary of these principles so presented that they could use it as a framework around which to group the more detailed technical information found in so many publications. The following outline has been found by many very satisfactory for such a purpose. In this outline it is impossible to give the proper credit to those whose ideas have been used, since despite the youth of the talking motion picture these ideas have become a part of the common stock from which all sound engineers draw.

## The Equipment

In order to take advantage of the possibility of the vacuum tube amplifier it is first necessary to transform the sound into an electric current. This is commonly done by an instrument which is known as a "mike" but officially known as a condenser transmitter. This is the principal item of the pickup equipment which is the first group which we shall discuss. These groups are:

1. Pickup Equipment
2. Monitoring Equipment
3. Amplifiers
4. Recorders
5. Power for drives and other equipment
6. Editing and cutting equipment
7. Re-recording equipment

The first five groups are concerned primarily with the original recording of the sound and the other two with the necessary modifications required before the final picture can be presented to the public. A rough diagram of the relation between these groups of apparatus is shown in Fig. 1. It will be noted that the sound after passing through the pickup equipment goes then where it is changed into an electric current, goes in this form through the monitoring equipment and the amplifiers to the recorders. All these groups of equip-

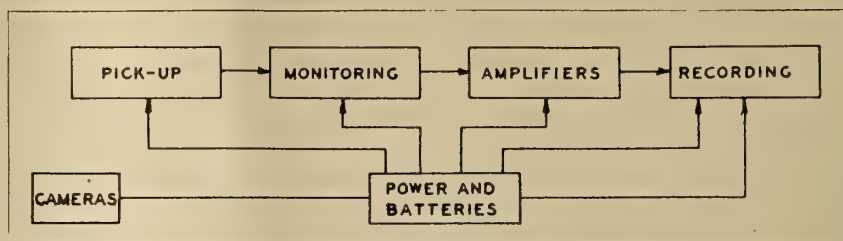


Fig. 1

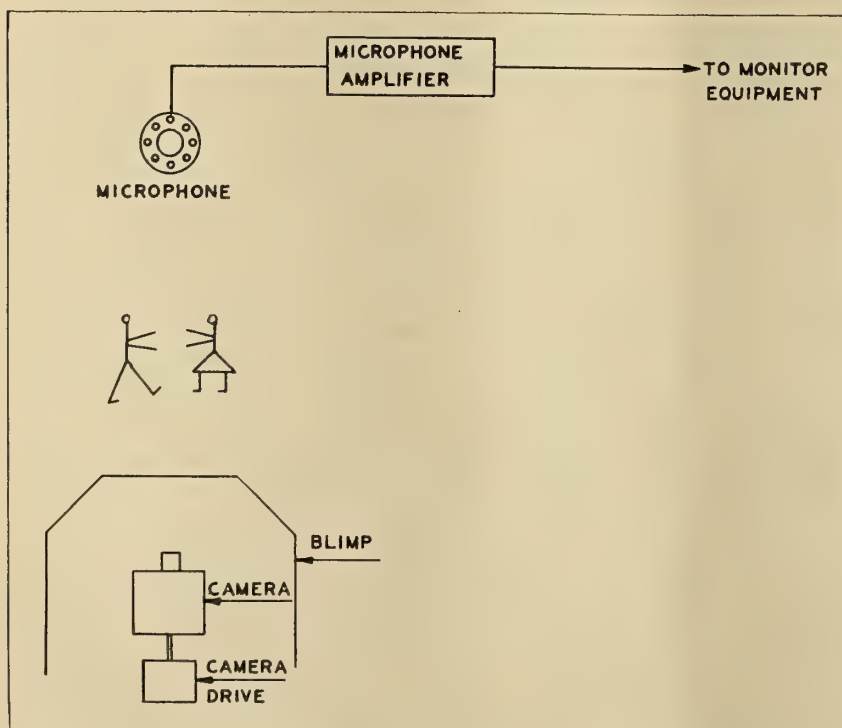


Fig. 2



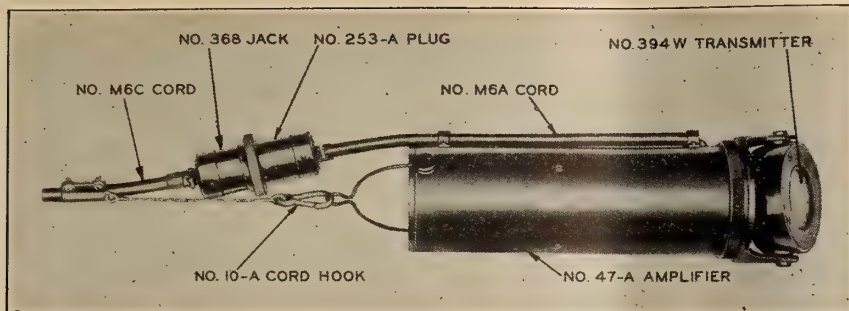


Fig. 3

ment require electric power for operation as indicated roughly in the diagram.

#### The Pickup Equipment

Returning now to the pickup equipment, let us consider that we are taking a dialogue on a sound stage. While in some cases sound may be prescored or in others may be recorded after the picture has been taken, the dialogue is usually recorded during the taking of the original picture. Therefore, we have on the sound stage, see Fig. 2, the actors, in this, as in most cases, a man and a woman, the camera or cameras with the necessary motors to drive them and the microphone with its amplifier.

During the taking of a picture it is of course necessary to exclude all sounds which it is not desired to reproduce in the theatre. Previous to the use of sound stages, and even today in open-air work, such sounds may be extremely troublesome. To a certain extent this condition can be overcome by placing the microphone close to the speakers and by using reflector devices, but such arrangements may distract appreciably from the final quality of the sound. Therefore, large enclosed stages are usually used for the recording of talk and music, other desired sounds and noises being frequently, if not invariably, introduced subsequently.

#### The "Blimp"

After the sound stages had been built, it was found that one of the most troublesome sources of noise on the stage was the motion picture camera with its intermittent. As a temporary expedient "dog houses" in which the camera man and his assistant worked were built for the cameras. These have been succeeded by "blimps" which may take almost any form or appearance, but no matter what their shape they all enclose the camera and its driving motor leaving the camera man outside, where at least he can breathe freely, although of course, he cannot whisper to his assistant as he often used to do, without spoiling the "take." All the camera companies are now working on a design of motion picture cameras which it is expected will be so quiet that the cumbersome "blimp" will follow the dog-house into oblivion.

#### Microphones

With the great improvements in technique it has become rather rare to use more than one pickup for the sound. It is true that the microphone should not occupy the same position for a close-up as it does for a medium or for a distant shot. However, better practice seems at the moment to dictate that the close-up and distant shots shall be taken separately and then intercut as may be desired rather than have them taken at the same time. This is not as difficult as it seems. Since when a separate sound track is provided for each type of shot it is not necessary that corresponding parts of each take should occupy the same length of time so long as voice and motion are kept in proper synchronism. So, in close-ups we will find the microphone placed quite close to the speakers and in more distant shots the microphone will be appropriately further away, provided the proper acoustic conditions are observed on the stage.

The amount of energy in the sound which reaches the microphone is almost infinitesimally small, and when the sound has been changed by the mike to an electric current, the latter is equally weak. Therefore, to prevent the loss of any part it is advisable that a small amplifier be provided quite close to the microphone, usually forming a part of it. Such a combination is shown in Fig. 3. The microphone and its amplifier are of

course rather delicate instruments and it was originally thought that it would have to "stay put" throughout a "take."

However, as the sound men have gained more and more experience with these instruments they have found that if they are properly suspended from a "mike" boom they can be moved around so that in close-ups the mike can follow the movements of the players around the set. The mike boom itself looks something like a long fishing rod set upon a tripod with a fish, in this case the mike amplifier, dangling from the end. In medium and long shots such motion of the pickup is usually unnecessary.

#### The Monitor

Unlike the human being the microphone has only one ear and being in close-ups placed very near the speakers, it hears a different quality sound from that which the directors or others on the stage hear. It therefore becomes necessary that someone listen to the sounds being recorded and that that someone hear them just as they will be reproduced later in the theatre. This person, usually a man, is known as the monitor man or mixer, the latter on account of another of his jobs. In the first sound stages the monitor is usually excluded from the stage placed in a big room by himself with the apparatus shown on Fig. 4. But while telephone communication was furnished between the monitor and the stage it was found difficult to always place the scenery so that the monitor could watch the action.

While vision on the part of the monitor is not absolutely essential it adds much to his peace of mind and enables him to take precautions against sudden outbursts of sound such as pistol shots in gang scenes, although nowadays the latter are usually dubbed in. Therefore, many of the studios now use what are called monitoring booths which are larger  
(Continued on page 42)

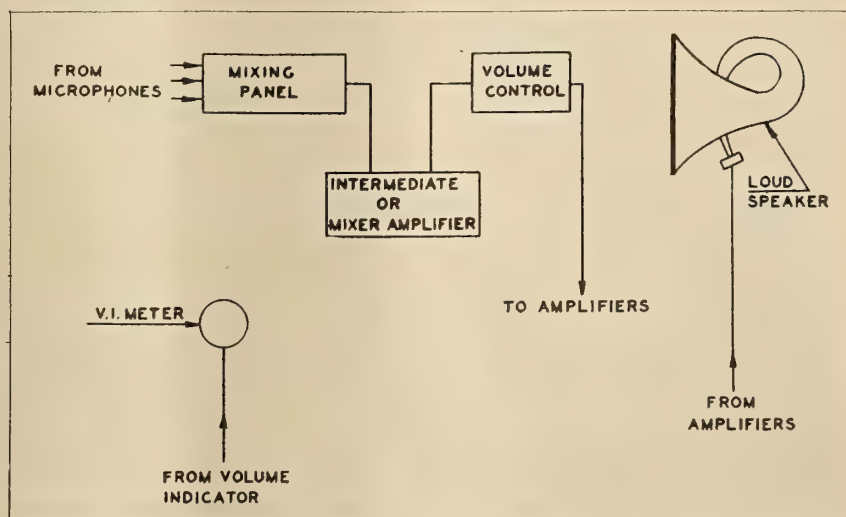


Fig. 4



# Theory and Fundamentals

By W. W. JONES

*Mr. W. W. Jones, whose Department will henceforth be a monthly feature of this magazine, has long been actively associated with the Motion Picture Industry. At the present time Mr. Jones is a member of the Engineering Department of RCA Photophone and has been closely identified with the educational activities of that organization since the time of its inception. He is a graduate of the Milwaukee College of Engineering and was at one time Instructor of Mathematics and Electrical Design at that institution.—EDITOR.*

## Tube Replacements

LIKE many other pieces of apparatus which do not require constant examination and attention, the vacuum tube is apt to come in for a certain amount of neglect. It goes along from day to day, maintaining the even tenor of its way, without any particular thought on the part of the projectionist as to its health and welfare. It is true that the tubes receive a weekly or a bi-monthly routine test by the service man during his call at the theatre, but many things can happen between the periodic calls of a service engineer, and the sudden development of poor sound, or even an actual sound outage, is so often attributable to faulty tubes that it is well for the projectionist to be prepared for such emergencies. The short discussion on common defects in vacuum tubes which is given in the ensuing paragraphs has been prepared with the thought that it may benefit the projectionist in enabling him to recognize the symptoms and to avoid the difficulties arising out of the use of such tubes.

Among the defects in vacuum tubes which may develop with age, or which may develop after a short period of operation, are loss of emission, microphonic tubes, development of gas in the tube, burned out filaments, loose elements and disarranged elements. Each of these defects will be treated separately. The remedy in each case is usually the replacement of the offending tube.

As a vacuum tube becomes old in use the electron emission gradually decreases until a point is reached at which the tube will not function in a one tube only, the result will be no sound, and the tube must be replaced before the amplifier can be used.

Vacuum tubes in which the elements are loose will cause grating and stuttering sounds at the loud-proper manner. This condition is

known as low emission, and its effect is to cause a loss of volume and distortion of the reproduced sound. This distortion will be more noticeable on low musical notes, and at high volume there will be a marked indistinctness in reproduction.

## Microphonic Tubes

A microphonic tube is one that causes noises or howl in the speaker, due to mechanical vibration of the tube electrodes. All tubes are more or less microphonic, but some are far worse than others. Certain amplifier stages are more susceptible to microphonic action than others, and it is often possible to arrange a set of tubes in an amplifier in such a manner as to eliminate a microphonic howl. Some tubes, however, may be so highly susceptible to microphonic disturbance that it is impossible to use them in any stage in the amplifier. Such tubes must, of course, be replaced. In some amplifiers the tubes of certain stages are mounted on sponge rubber and enclosed in protective metal covers to lessen this effect. When such covers are used, they should be kept securely in place at all times.

It is not always easy to detect gassy tubes by observation. If, however, a tube develops a blue haze during operation, this haze appearing on both the inside and the outside of the plate, it is usually an indication that gas is present. It is well to know, however, that many good tubes will show a haze during operation. This haze should clear up after a few minutes of operation. If the tube has a high gas content, arcing may occur between the grid and the plate when operating at high volume. It is possible to detect this condition by looking down through the top of the tube. Gassy tubes will cause distortion and less volume, and in extreme cases noisy reproduction will be noticed.

## Burned Out Filaments

Filaments which are burned out may be easily detected by the fact that they fail to light. In stages in which two tubes are used, such as push-pull stages, the effect of a burned out tube is to reduce the volume. If the amplifier stage employs speaker. Defects of this nature may show up after the tube has been in use for some time, but ordinarily they manifest themselves after a short period of operation. An easy method for locating tubes having loose elements is to tap the top of each tube lightly. The disturbance in the

speaker will be aggravated when the defective tube is tapped. The same indication at the speaker is manifested if the socket contacts or the tube prongs are dirty so that it will be well to check this before replacing the tube. Fine sand paper may be used to clean the tube prongs and the socket contacts. After performing the operation, be sure that any loose grains are removed by blowing or wiping the surfaces with a clean piece of cloth. Care must be exercised when cleaning socket contacts to see that they are not bent or broken. Never clean such contacts while the voltage is turned on.

Disarrangement of tube elements is usually the result of rough handling. Always handle the tubes carefully, especially if they are removed for any reason while they are still hot. Tube elements which have become disarranged may result in no sound, low volume, and noisy or distorted reproduction, depending upon the nature of the case.

## The Push-Pull Amplifier

THE push-pull principle is often used particularly in the final or power stages of the modern sound equipment amplifier. The purpose of these final stages is to deliver undistorted power to the stage loudspeaker, and to avoid the development of any great amount of voltage amplification. The purpose of the voltage amplifier stages which precede the power amplifier is to build up the small output voltages of the photocell or the magnetic pickup, so that the large voltages required to swing the grids of the power tubes may be obtained.

In the push-pull amplifier two vacuum tubes are used for every stage which the amplifier employs. These tubes are not connected in parallel, but are so connected that the signal current from the preceding stages is divided between the two tubes of each power stage through which it passes. This arrangement permits amplification of strong signals without overloading the tubes.

In order to illustrate the principle involved in the push-pull method of amplification, it will be the purpose of the following paragraphs to show what takes place in a single stage amplifier of this type.

The apparatus used in a one stage push-pull circuit consists essentially a center-tapped input transformer, two vacuum tubes having identical



characteristics, and an output transformer, or a choke, having a center tap.

The output of the last voltage amplifier stage is coupled to the power stage by means of the power amplifier input transformer. The center-tapped side of this transformer is the secondary and the grid biasing (negative) voltage is applied to this tap. The two outer ends of the secondary winding are connected one to the grid of each of the two tubes in the power stage. The center-tapped side of the output transformer is the primary side. The plate (positive) voltage is applied to this center tap. The two outer ends of the primary are connected one to the plate of each of the power tubes. The two ends of the output side of the output transformer are connected to the voice coil of the loud speaker.

The action of the circuit is as follows: Since the two outer ends of the secondary winding of the input transformer are connected one to the grid of each power tube, it is obvious that if at any instant one of the grids is positive with respect to the center terminal, the other will be negative, or in other words, if a positive potential is impressed on a grid of one tube, a negative potential is simultaneously impressed on the grid of the other tube. This means that the secondary voltage of the input transformer is equally divided between the two tubes of the circuit. The result

is a corresponding increase and decrease in the plate currents of these tubes, because the plate current is governed by the potential of the grid.

The plate circuit of the two power tubes will now be considered with respect to their relation to the output transformer. In a moment of zero signal a steady plate current flows in the primary windings of the output transformer. This current is in opposite directions from the center tap of the transformer. These currents therefore oppose each other, and their magnetizing effect on the transformer core is neutralized so that there is consequently no magnetic flux present.

When a voltage is impressed on the grids, its effect is to increase one of these opposing plate currents and decrease the other. As a consequence, the windings on each side of the center tap combine in their effort to produce a changing magnetic flux in the transformer core. This changing magnetic flux interlinks the secondary winding of the output transformer, thus producing the signal current in this circuit.

The principal advantages of push-pull amplification are that it decreases distortion caused by working a tube over a curved part of its characteristic, and in the case of "B" batteries which are prone to be noisy or a poorly filtered plate supply, it cancels out the irregularities of voltages which would otherwise produce disturbances in the speaker.

## Report of the Sound Committee

(Continued from page 19)

be without the absorptive device but its sharp selectivity of the direction from which it effectively receives sound makes it appear promising.

### Camera Silencing Devices

Silencing of cameras became necessary with the advent of talking pictures. While the ideal method would be to use a silent camera, until such perfection is attained, it is necessary to place the existing cameras in some form of silencing box. This, in the first place, took the form of a camera booth large enough to house one or more cameras and the cameramen. Being extremely cumbersome and heavy, it was in some cases very difficult to place on a set and of necessity soon gave way to handier methods.

During this preliminary stage, much thought and work went into the methods of camera maintenance which resulted in their being brought to a higher state of mechanical perfection than had ever before been attempted in the industry. It was also found that the commonly used means of interconnecting the camera and the camera drive motor by a flexible shaft

was a great source of noise. This camera drive was a development of talking picture equipment which the weight of the early motors made necessary, as it was not practical to hang much weight on the camera structure.

### Evolution of Devices

At this period each studio investigated camera silencing in its own way. By a process of experimentation and elimination, the present-day devices were evolved. They are by no means ideal and are being continually changed and improved. The generally accepted opinion is, of course, that the ultimate solution of this problem will depend on the development of a silent camera which it will not be necessary to enclose.

In camera booths, the natural development was along the lines adopted by most studios (with a few exceptions). That is, an individual camera enclosing box which, in its early stages, was simply a wooden framework covered with various sound insulating materials. This did not silence the camera sufficiently to permit its use within fifteen or twenty

feet of a microphone and it was soon replaced by more efficient designs. It is unnecessary to follow the various stages of this development, but from a survey of the present-day equipment it is easy to see that it is simply an elaboration of this silencing box.

### "Bungalows" and "Blimps"

The new camera silencing devices became known as "blimps" or "bungalows." In the majority of cases the bungalow was made to contain the drive motor as well as the camera. Some of the studios adopted a form of drive motor which was mounted directly on the camera; others retained the flexible shaft but enclosed it inside the bungalow. One or two of the studios made separate bungalows for the motor and the camera, and covered the flexible shaft with heavy layers of sound insulating material.

The Fox Movietone Studios adopted as standard a camera bag composed of rubberized cloth, kapoc floss, and other soft insulating materials, fastened by means of zippers and snaps. The lens and finder protrude through the bag.

With the adoption of the heavy bungalow covered camera, a very much stronger and more rigid camera-tripod became necessary. The bungalows used by Warner Brothers and United Artists are light enough to mount on the standard tripod. Most of the other studios adopted either a tripod which was developed by Metro-Goldwyn-Mayer in collaboration with Pathé, or else an adaptation of this, used in conjunction with a standard tripod for rigidity.

The Academy of Motion Picture Arts and Sciences under date of May 14, 1930, published through their Technical Digest Service, Report No. 3 of the Producers-Technicians Committee relating to camera silencing. This report gives in detail a complete résumé of all such devices in use at that time. It includes information on the insulating value in decibels, the methods of construction, materials used, and the distance that a microphone can be used from the camera.

### Noiseless Recording Methods

The noiseless method of recording on film, announced at the end of 1930, appears to be receiving general acceptance throughout the industry. RCA Photophone has described two methods of effecting noiseless recording on variable width track. One of these displaces the zero line on the track in such a manner that the clear portion is only just wide enough to carry the modulation. This is subject to the disadvantage that weaving on the projector may cut off some of the weaker sounds. The second method uses a movable shutter during the recording which causes the clear part of the sound track to become blackened in those portions which are not employed to carry the modulation.



The Western Electric Company has announced a noiseless recording system which is applied to their variable density method. The density of the sound track is increased during the intervals in which the sound volume is low, and is decreased according to the envelope of the sound currents in such a manner that the film is always just able to accommodate the required modulation.

The Fox organization has devised a means for flashing lamp variable density recording, in which the intensity of the lamp is reduced during the intervals of low sound amplitude, the intensity being altered during the process of recording.

A number of independent makers of sound equipment, most of whom are using the flashing lamp, have announced attachments to their equipment which produce essentially similar effects.

#### How Accomplished

The reduction of noise is accomplished during the actual recording by an attachment to the recording system, and, in general, involves no change in recording or processing technic. The amount of noise reduction which is being employed in most studios at the present time is of the order of 10 db.

#### Set and Studio and Theatre Acoustics

Extensive investigations have been made by many interested in the factors concerned in set and studio acoustics and theatre acoustics. In some cases these studies have been made with recently developed instruments, permitting more accurate results than those previously obtained by aural methods. Several factors have been discovered by such means, some of which have contributed to the development of a more general formula for the computation of the time of reverberation. The application of this formula, which has been published by Dr. C. F. Eyring, of the Bell Telephone Laboratories, is of particular value in set and studio work, where average absorption coefficients are comparatively high. Important studies of the effect of relative humidity on sound absorption are being made.

#### Reverberation

The necessity for consideration of the reverberation existing throughout the frequency spectrum is now well appreciated. Whereas many enclosures had in the past been acoustically treated, giving consideration only to the reverberation at 512 cycles, experience in many of these cases indicates the necessity for obtaining suitable balance between the reverberation at the low and high ends of the frequency spectrum relative to that in the central portions of the range.

It is becoming the practice to adjust theatres and recording studios to have times of reverberation throughout the frequency spectrum such as will give definite rates of decay for sounds of equal loudness. With the application of suitable accurate instruments for the measurement of reverberation times, studies have been made of the relative effects of connected volumes, which have an important bearing on complex auditoriums, as well as on recording sets on large stages. Further study, by instrumental means, has indicated the effect of direct reflections to be of importance and requiring consideration in the design of auditoriums, in addition to the consideration given the reverberation time.

#### Low Noise Level Required

The importance of maintaining a very low noise level has been extended to cover not only the studio, but the theatre. This has become more necessary with the development of recording methods insuring a lower background level in the sound picture. Attention must be given to the transmission of noise from the projection room into the theatre, from the ventilating systems, from sources external to the auditorium, and to miscellaneous noise sources within the auditorium.

More information is available upon the acoustic power required to provide satisfactory sound volume in an auditorium. It is, therefore, possible to predict more accurately what effect the introduction of absorbing material into an auditorium will have upon the sound volume and, where necessary, upon the electrical requirements of the system.

Many improvements have been noted in existing commercial materials and a large number of new materials suitable for studio and theatre use have been developed and introduced in the past year. This has considerably widened the field for obtaining materials having the desired acoustic characteristics for the particular application and which will be more readily acceptable from the standpoints of architectural appearance, fire hazard, and cost.

#### Preservation of Sound Prints

The Committee has been fortunate in receiving from a firm prominent in the film industry the results of tests, conducted over a period of two years, of processes which purport to preserve motion picture film. The method used in these tests was to prepare loops of film, half of which were processed and half unprocessed, both sections being taken from the same reel or roll. These loops were projected 300 times, with examination at 100, 200, and 300 runnings, on a specially prepared projection machine, which caused as little wear as possible.

The processes tested were such as

lacquer, surface hardening, whole surface waxing, chemical impregnation, liquid edge waxing, etc.

The noticeable effect of the processes investigated was that the film became seasoned more quickly, so that during the first few times of projection, the emulsion did not collect on the shoes and tracks of the projection machine as is often the case with green emulsion.

There was also indication from this set of tests that liquid edge waxing provides comparable protection. Once past this initial period, however, it was not evident that the processes provided any material improvement in giving greater lasting qualities to the film.

#### Talking Motion Picture Equipment for Home Use

In recent years several talking motion picture equipments have been developed and offered for sale for home use. Practically all of these equipments use a 16 mm. projector with either a flexible shaft or geared connection to a synchronous turntable for disk reproduction of sound. All the devices examined, except one, project 24 pictures per second and employ a turntable driven at 33 $\frac{1}{3}$  rpm. This one exception projects 16 pictures per second and the projector and turntable are driven by electrically interlocked motors. In order to maintain synchronism with the 33 $\frac{1}{3}$  rpm. turntable, every third frame is removed in printing from the negative to the positive.

At the present time 16 mm. films synchronized with sound are difficult to obtain and are expensive. If an extended library of films were available, it is probable that a larger demand would appear for home talking movies. To date, the supply of films is extremely limited and these films are available only in the larger centers, requiring personal application to obtain them and personal return. This mitigates against very extended use of these films and is a serious detriment toward obtaining a large market for the reproducing equipment in the home.

#### Non-Theatrical Equipment

Considerable demand is apparent for talking motion picture equipment for non-theatrical uses, this equipment to be used either for advertising purposes, instruction work, in schools, churches, etc. Equipment for this purpose is built by all the leading talking motion picture apparatus manufacturers. The trend seems to be toward a 35 mm. film with sound on the film, although some equipment has been built with the idea of using 16 mm. film and a synchronized disk, which permits a picture of sufficient size and brilliance of illumination for small audiences. Libraries



are being developed which will undoubtedly stimulate the exploitation of such equipment.

### Sound Equipment in Theatres

On January 1, 1931, there were reported to be in the United States 13,515 theatres equipped for sound reproduction and 8,209 theatres unequipped. It might, therefore, appear that during the period of sound equipment installations only about 63 per cent were completed. Many of the theatres now running silent, however, are unprofitable houses which may never be able to afford sound equipment. With the decreasing number of silent picture releases, these theatres may be forced to close. It follows, then, that the installation period is well over 63 per cent completed. Perhaps 80 per cent would not be too high a figure.

It may be considered that the industry is passing out of the installation period and is now entering a period of stability in operation and of refinement. The novelty value of sound has passed with every indication that sound has become as necessary a factor in the theatre as is the picture on the screen.

### Problems Involved

The first problem of theatre projection is obviously to keep a picture on the screen and to maintain sound from the horns. It so happens that statistics from Electrical Research Products, Inc., are available, which show the ratio of emergency calls to theatre installations in the United States over a period of time. In December, 1928, with roughly a thousand theatres equipped, the ratio of emergency calls per week to theatres in service was about 0.185. In December, 1929, with 3,300 theatres equipped, the ratio had fallen to about 0.05. In December, 1930, when nearly 5,000 theatres were equipped, the ratio was as low as 0.022.

This decrease in emergency calls is caused by improvements in design and manufacture, and to proper and continued maintenance of the equipment. It is logical to believe that the operating troubles experienced with other reputable systems follow somewhat the same general course. It is consequently obvious that the first requirement of sound projection, namely, consistent and reliable operation, has been achieved.

### Acoustics

Poor theatre acoustics constitutes one of the most serious causes of poor sound reproduction in theatres. Acoustic analyses have been made in a large number of theatres and corrections of the conditions have been made in some cases. It often happens that the theatres less able financially to make the correction need it most. It has been proved in so many cases that improved acoustic conditions result in increased box-office returns that the

expense of the change has been thoroughly justified. It is believed and hoped that more theatres can avail themselves of this improved condition not only for their own salvation but to give to the public all the benefits of the improved products which could not otherwise be realized.

There has probably been a healthy although unconscious competition between the studio and the theatre in striving toward higher quality. Such improvements as better reproducers for disk records, finer optical systems, and smoother mechanical features for film reproduction, along with other general advances applicable to both methods, have raised the standards of the theatre equipment to the point where they are capable of handling good quality recordings. Improved technic in the studios, resulting from such factors as study of stage and set acoustics, microphone placement, better knowledge of re-recording methods, and more exact control of film processing, have made it possible for the studios to show a tremendous improvement in the quality of the recorded product.

The gradual extension of the frequency range has been a material contribution to this improved quality but efforts toward a greater range should be and are being continued.

### Items for Further Investigation

The considerations which dictate the preferred sound track size and location are twofold—first, engineering, and, second, economic. For the present the second of these dominates. Engineering considerations tend to favor an increase in sound track width over the present track, although such an increase cannot be carried on indefinitely without encountering further engineering difficulties.

A number of locations for the sound track differing from the present have been proposed. The majority of these offer little to be gained from an engineering standpoint. Their effect is mainly to permit a change in the present picture size, and the principal difficulty standing in the way is an economic one. Until it has been possible to make a further engineering study of this problem, it would appear to be undesirable to disturb the producers' and theatre owners' efforts to stabilize their economic positions by the introduction of equipment necessary to effect a relatively slight engineering or artistic improvement.

### Sound from Separate Film

At the time when sound recording and reproducing was just getting a start, the need for double film was felt rather strongly. Some difficulty was experienced in the proper processing of both sound and picture on the same film, and, in addition, the theatre reproduction apparatus was less effective than it is today. At that time the industry was often able

to obtain better than normal results by using the double film.

At present the situation is quite different. Theatre reproduction apparatus has been greatly improved, and, moreover, a large part of the available theatres have been provided with sound apparatus at considerable cost. To supersede this apparatus or to modify it in any way would represent a substantial increase in cost to the theatre and would present an economic problem which should not even be proposed unless substantial advantages are to be derived from the change.

Separate sound film installations would permit:

- (1) Control of sound film independent of the picture;
- (2) Separate handling of the release print in processing;
- (3) Wider sound track;
- (4) Higher running speed for sound track.

There are no data existing to show that these improvements warrant an expensive change. In the first place, it is no longer considered a serious handicap to the sound record that in variable density records a negative development must be accommodated to the processing of the composite print. By proper choice of conditions, satisfactory results can be obtained differing only in volume from what might be obtained with the separate sound film. Noise reduction technic applied to the composite sound record is adequate for practical theatre requirements.

### Practical Solution Found

Secondly, studio and laboratory technic has found practical solutions of most of the problems of development of picture and sound records on the same film, in positive form. This did not always seem feasible, but present results indicate no particular handicap. As a matter of fact, the positive control enforced by sound requirements has produced a general improvement in average picture print quality in many cases.

Somewhat the same reasoning applies to the wide sound track. With the track twice as wide as at present, an improvement of the order of three db. in signal-to-noise ratio should be obtained, with no change in quality. This improvement is scarcely sufficient to justify a large change in theatre apparatus, in the light of noise reduction studies which are at present under way.

The case of high running speed for the sound track has advantages since the greater the speed of the track the greater the ease of recording high frequencies. There should be no difficulty, however, in recording frequencies up to 6,000 or 7,000 cycles on existing film stock running at the present standard speed. The present recording and reproducing equipment,



at least with modifications and improvements which will be made as the art progresses, should be capable of recording and reproducing this frequency range. It would, therefore, seem wise to exert efforts to obtain good, clear reproduction with present facilities rather than to introduce additional means for extended range at this time. Ultimately the state of the art may warrant the recording and reproduction of very high frequencies in the audible range but it is not believed that the time is opportune to consider costly changes toward this until full advantage is taken of present equipment.

### Economic Considerations

An important economic phase of the handling of film is the mechanism of release through the exchanges. Handling and shipping problems are such that the extra cost and complication of handling a separate medium for sound is almost prohibitive. Moreover, the problem of maintaining synchronism must be admitted. No numbering system, however complete, can be as satisfactory in this respect as to have the picture and sound records unalterably tied together on the same film. Even at present, the producers annually furnish thousands of feet of short replacements to take care of inadvertent or deliberate changes of a print in the exchange or theatre to accommodate a particular situation. It has never been possible, thus far, to prevent such changes being made. Obviously, it would be very much harder to handle this phase of the problem on a double medium basis.

In the light of this brief analysis, it is the Committee's definite recommendation that the Society should take a stand in favor of improvements known to be possible in the present standard composite picture and sound print.

### Volume Control in Recording

In the recording of sound for audible pictures, the volume range of the sound record is defined on the upper side by the overload point for the second track and the cutover point for the disk, and on the lower side by the masking effect of the inherent noises in the sound record, known as ground noise or surface noise. This volume range was originally in the neighborhood of 30 db. and there was little choice between film and disk. As pointed out elsewhere in this report, the adoption of noiseless recording systems has increased the volume range on the film record by approximately 10 db.

In order to obtain a satisfactory ratio between the sound and noise level it was the custom in the past to raise the level of the weaker passages and lower the level of the louder passages at the time the record was made and to furnish the theatres with cue sheets directing the projectionists to lower or raise the sound level at these

points by amounts specified in the cue sheet. In practice, this has not proved entirely successful, as the projectionist's attention has been so largely occupied by other matters that he has been unable to properly follow the instructions given in the cue sheet. It has been found practicable to record the sound on the film at the levels at which it is intended to be reproduced in the theatre. The cue sheet is, therefore, being abandoned. Consideration is being given to marking on the beginning of each reel in appropriate fashion the relative levels at which the reels should be reproduced.

The Committee will give further consideration to this important problem but suggests at this time that the trend be continued toward recording the sound at the proper levels.

### Film Development

During the past year, radical

changes have taken place in film developing. Almost universally, the use of machines for release prints has become standard practice. The developing of picture and sound negatives by machine has become almost general, as the results of machine development have proved to be superior in obtaining uniformity and freedom from mechanical injury. A matter that requires further study is the composition and maintenance of the chemical bath.

Although information is available to permit the proper development of sound film, and devices for controlling and checking the methods are at hand, the full use of such facilities is not yet being made. A uniform and consistently good product can only be obtained by constantly employing such instruments as a means of checking the results.

## Monitoring and Control

*The S. M. P. E. Subcommittee on Monitoring and Control of Sound in Theatres is composed of H. B. Santee, Chairman, and the following members, L. Isaac, R. Miehl, F. H. Richardson, M. Ruben, and L. Townsend. The Subcommittee's survey and recommendations concerning methods of volume control should prove of interest.*—THE EDITOR.

IN the report of the Projection and Sound Reproduction Committee, which was presented in abstract before the Society at Washington, and in full before the New York Section, June 12, 1930, there appeared a section on adjustment of volume levels and remote control. This report dealt principally with methods of controlling volume directly by an observer in the auditorium. As a matter of fact there are now devices on the market which permit such control. Whether the use of these devices has proved effective is not clear but the fact remains that there is a general urge to investigate fully the whole problem of volume control.

There are three distinct systems for providing volume control for theatres:

- (1) the method most generally in use which, to be effective, requires an observer in the audience who signals the projectionist for volume change;
- (2) the method described in the above report which provides actual control of volume by the observer in the audience;
- (3) a method which attempts to give to the projectionist some means of knowing what volume of sound is present in the auditorium, from which means he can adjust the volume from the projection booth.

Before discussing the advantages and disadvantages of these three methods, we may observe:

(a) The present monitor horn functions reasonably well for the purposes for which it was intended, namely, (i) means of checking the sound system before the start of a show and (ii) maintaining a running check of the system during its operation.

(b) It seems evident that from a theoretical standpoint the best location in which to hear the results obtained in the auditorium is in the audience itself. An observer placed in the audience hears just what the audience hears, can take into account the audience's reaction, and note the effect of the changing number of people, which in many houses materially affects the sound absorption.

### System (1)

System (1) is based on the theory that the actual volume control should be handled by the projectionist, and further, that the proper place to judge volume is in the auditorium itself. This system, therefore, has two most desirable features. The disadvantages are:

(a) A slight time lag between the giving of a signal by an observer in the audience and the volume adjustment made by the projectionist.

(b) The increased expense of having an observer in the audience.

(c) A chance of carelessness on the part of the observer or on the part of the projectionist which will result in poor operation.

(d) The arrangement being described anticipates a rehearsal before the opening of the show. With the new release print in vogue, the need of such a rehearsal is less since the change-over cues are automatically indicated.

To refute these objections it might be said of (b) that a first-class house can well afford such an observer (who would be absolutely essential to sys-



tem (2) which is to be described below), and furthermore, that a small house which could not afford an observer could probably not afford additional monitoring equipment unless it were very cheap. Additional equipment requires maintenance and usually the cheaper the equipment the greater the maintenance.

Item (c) anticipates carelessness on the part of the personnel but no matter what system is employed carelessness results in a poor show.

Item (d) is included under carelessness because if the manager is alert a rehearsal should be demanded even if only for sound cues.

#### System (2)

System (2) indicates actual control of volume by the observer in the audience. This system has the advantage of reducing time lag to a minimum and permits the control to be handled in the audience, which is the best position for such observations. The disadvantages are again, the additional expense in providing an observer and the absolute necessity that this observer must always be present, for if he is not, the entire method is not workable. It might further be observed that the man in the audience must have knowledge of the capabilities of the system itself, otherwise he may overload the amplifiers in attempting to override audience noise during periods of applause or laughter. The best arrangement of this system calls for remote control of the fader because if the audience control is simply an auxiliary to the fader in the projection room it produces additional loss in the amplifier system which may be disastrous if perchance the amplifier system gain is only sufficient to meet normal operating conditions. There is, furthermore, a tendency toward split responsibility, which is not ideal.

#### System (3)

System (3) anticipates that the projectionist may have some means of knowing what is taking place in the auditorium, so that he may have entire control of volume adjustments. Any such system will obviously be more elaborate and costly than either of the other two systems described, and whether it will be more effective and usable is doubtful.

There are several methods proposed to accomplish system (3):

(a) One system provides a microphone, or several scattered microphones, connected to an amplifier and then to a loud speaker located in the projection room.

The advantages are claimed to be that with a microphone in the audience the sound from the horns can be picked up and the projectionist can then know what sound is being received in the auditorium. In other words, the projectionist's ear has in

a sense been extended into the auditorium proper.

It must be remembered, however, that it will be necessary to calibrate very carefully the over-all gain of the amplifier system so that the sound in the projection room will definitely indicate whether the volume in the house is lower or higher than it should be. If anything goes wrong with the equipment so that the over-all gain is changed, the results obtained in the monitor horn will not indicate the true condition. Furthermore, the microphone will not completely reflect the effect caused by the changing number in the audience. Any effect from noise in the projection room which now hampers good hearing with the present monitor would also apply even to a greater extent to the proposed system.

(b) A second method proposed makes use of a microphone or several scattered microphones in the auditorium connected through an amplifier into a volume indicator.

The advantage here would be that a visual indication is presented to the projectionist which would not in any way be affected by the noise in the projection room.

#### Disadvantages

There are several disadvantages. To make the system effective there should be an optimum point of operation indicated on the meter of the volume indicator with maximum and minimum points shown, above or below which the sound should never be allowed to go. The difficulties in designing such a meter and accompanying circuit are extreme. Furthermore, noise picked up from the audience, such as laughter or applause, immediately indicates increased volume on the meter.

In present-day projection rooms, which are fairly well sound-proofed, a projectionist might conceivably react in such cases by believing that the sound volume through the horns is too loud and, as a result, he may reduce the gain of the amplifier system when it really should be raised. Again a very careful calibration would have to be made in order that the indicator would give a reading of true conditions. If any of the constants of the circuit should change, an incorrect indication would result, with corresponding improper sound volume in the house. Likewise in this case, as under item (a), the microphone will not definitely take into consideration changes in the number of persons in the audience.

(c) A third method has been suggested, using a headset instead of the loud speaker in the projection room. This has such obvious disadvantages from an operation standpoint that there is no need for discussion.

#### Conclusions

It is the opinion of the Committee, that:

(1) The proper and best place for observance of volume is in the auditorium among the audience;

(2) Any manually operated volume control system requires that the observer be trained to judge proper volume in the auditorium;

(3) There is not at the present time any mechanical or electrical device which will give to the projectionists any satisfactory means of judging volume;

(4) With the observer stationed in the auditorium it should be recognized that the responsibility of the projectionist in controlling volume is only to react to the observer's signals promptly and diligently;

(5) Until some other means not now apparent are provided, the present system of volume control, as now installed in the majority of theatres, is the most satisfactory. This system provides signaling means for the use of an observer in the auditorium to inform the projectionist when to raise or lower volume and assumes a competent observer and painstaking projectionist, which are requisites for a good performance in any and all cases;

(6) It is of the utmost importance that the manager be made to realize that the responsibility for obtaining good sound reproduction is primarily his own responsibility. He must provide at all times a trained observer, whether it be himself or someone appointed for that purpose. He must educate himself to know whether the sound system is working properly and that the projectionists are responding to the signals of the observer;

(7) Regardless of where the volume control mechanism is operated it would be advantageous that the projectionist be able to hear what is taking place in the auditorium. It is urged that efforts be continued to make such means possible.

#### M-G Set to Replace Batteries

Among the latest developments in the field of talking motion picture appliances is a new motor generator the purpose of which is to supplant the storage battery as a source of low voltage for loudspeaker fields and exciter lamps. The new power unit is a product of the Electric Specialty Company of Stamford, Conn.

When the outfit is to be used for exciter lamps, a filter system of a simplified type is furnished. Filters, however, are not used when the equipment is to supply speaker fields only, it is said. The installation of the new motor generator is extremely simple, the machine merely being connected in place of the storage batteries.



# Patents:

*A series of instructive and interesting articles on how patents are obtained and sold.*

By RAY B. WHITMAN

NOTE: In this series of articles Mr. Ray B. Whitman, practicing patent attorney of New York City, explains in understandable non-technical language, just what a patent is, how one is secured and how it may be sold. In addition, Mr. Whitman offers to the readers of this magazine personal advice without obligation on any subject connected with patents, trademarks, designs, or copyrights. All inquiries should be addressed to Mr. Whitman in care of this magazine.—EDITOR.

## The Cost of a Patent

THE cost of preparing and filing a patent application on a simple invention involving not more than one sheet of drawings, should be in the neighborhood of \$125, but it may be more or less depending upon the skill and reputation of the attorney. This amount includes the government filing fee of \$20, the draftsman's charge for the drawing, and the fees and other expenses of the attorney. More complicated cases are, of course, correspondingly more expensive. And where the attorney has to leave his office, as to inspect a machine in some shop, he of course must charge you extra for his time and traveling expenses.

The attorney's charge for each amendment, while the case is being "prosecuted" or contested with the Patent Office, before allowance, is often about \$25, where there are no unusual complications. Sometimes only one amendment is necessary in order to get all the protection to which the inventor is entitled. More frequently, however, two or three amendments are made, and in very important cases, especially if the invention is at all technical, five or six, or even more, may really be necessary. It all depends upon the state of the prior art, the thoroughness with which the invention has been claimed in the application, and the skill and aggressiveness of the attorney who prosecutes it.

This is the hardest part of the work, and requires the greatest skill. Also, it is usually the part that is badly neglected, and responsible for the greatest loss of rights to the inventor. Therefore, you should here co-operate with your attorney in every way, and provide him with sufficient funds to do the work properly.

The definite amounts stated above as being the usual cost of a patent, are merely representative, and to help the inventor gauge in a general way whether he is paying too little or too

much. And of the two, shun the first as you would the plague. Nowhere is the old adage, "You can't get something for nothing," more true than in patent service. Trying to save a few dollars here may mean a loss of thousands later on, through your patent being worthless. The skill of an attorney is as vital to an inventor's success, as a doctor's skill in a serious illness may be to his life.

## Co-operating With the Attorney

The inventor should now take a keen interest in the preparation and prosecution of his case. He should possess sufficient fundamental knowledge of the work to be done to have an intelligent appreciation of his attorney's work; know when to leave him alone and when, perhaps, to offer some constructive suggestion; and when to tell, in plenty of time to correct the situation, if the attorney's work is not up to standard, and ought therefore to be augmented by some other counsel, or in extreme cases, substituted for.

Remember always that the law permits you to substitute another attorney at any time. You have merely to consult the new attorney, and request him to prepare a new "power of attorney" in his favor, so worded that all former powers are revoked. You then sign this paper, which he forwards to Washington, and the former attorney is notified by the Patent Office that he no longer represents you. That is all there is to it.

The inventor should begin by frankly disclosing to his counsel every portion of his invention, for the disclosure must be complete if the patent is to be valid. If any necessary part of the invention is omitted from both drawings and description when the case is filed, it becomes "new matter," which cannot thereafter be included, resulting either in total loss of rights, or at least in needless expense for filing another application on the omitted part.

The more, then, that the inventor knows about the attorney's work, the better off he is. These following facts should therefore be carefully noted.

## The Complete Disclosure

The attorney first has a drawing made of the invention, if it is mechanical in character. This should cover every essential detail, as conceived by the inventor. Any attempt to limit the disclosure to the part of the inventor's idea which it is thought represents invention may be responsible for great loss to the inventor

later on. Fortunately, no really reputable attorney will risk being a judge in such matters. That is solely the function of the Patent Office Examiner. The attorney's is, properly, always constructive, never destructive. And even the Examiner is never properly antagonistic to the inventor's just rights, but instead resolves all doubts in his favor, and aids with constructive suggestions when possible.

Acting upon this idea, then, the skilled attorney will have the draftsman put into the patent drawings every essential detail of the invention as conceived by the inventor; for later on, it might well happen that some such apparently inconsequential detail is the really valuable part of the invention.

## Good Drawings Are Important

Clear, understandable drawings, well executed, showing not only the essential features of the invention but the necessary details as well, are a great aid in getting a good patent. They help the Examiner to a rapid and clear understanding of the nature of the invention, and leave his mind free to determine those features which are patentable by comparison with the prior art.

Good drafting work, also helps the attorney to prepare a better case. And finally, it makes the patent more salable after it issues, by making it more understandable to most manufacturers and investors.

The best patent draftsman combines the skill of the mechanical draftsman and the freehand artist. Particularly in complicated mechanical cases, he is able, by the use of perspective views, partly cut out, or "in phantom," to show clearly in a few figures on one or two sheets, what could only be shown dimly in many figures on many sheets, when using flat plane views, such as side and top elevations.

One of the figures of the drawings should by disclosing the most essential feature of the invention, be made adaptable for illustration in the Official Patent Office Gazette, where it appears the week the patent issues.

## Preparing the Specification

When the drawings have been prepared, the attorney then begins work on the "specification." This is a description, in detail, of the construction and operation of the invention. It should begin with a few paragraphs broadly stating what the invention is, and what it seeks to accomplish, and also how it compares with the prior art.

As regards this last, however, care should be taken to make no negative statements regarding the extent of the invention. When this is neglected, the inventor sometimes finds himself in the position of having disclaimed



an essential part of his invention, through such limiting or negative statements made by his attorney in these opening paragraphs. It is a frequent point of attack by opposing interests during patent infringement suits.

Next in order in writing the specification is a statement describing what each view of the drawing is and what it is intended to show. After that, a complete detailed description is given of the parts or "elements" of the invention, each element being referred to by a different number on the drawings, the same numerals being used throughout the several views. Then follows an explanation of the exact operation of the invention.

Throughout the whole description the skilled attorney will be careful to use various broadening statements and alternative words, when describing the different parts, to show clearly that the inventor's conception is not limited strictly to the particular disclosure, but contemplates broadly any equivalent which will act in lieu of the various elements to perform the real invention which the patent seeks to protect.

#### **The Claims Are the Most Important Part of the Patent**

Now follows the very vital part of the patent, namely, the "claims." These are a series of paragraphs, numbered consecutively, each containing a statement of one or more of the elements in combination, together with certain limiting or descriptive expressions modifying them. These claims are by far the most difficult part of the patent to write, and require the highest skill in an attorney to completely protect the invention. For he must so thoroughly claim all of the invention as to prevent a competitor from making or selling not only the complete device disclosed in the patent, but every essential part in its various patentable combinations with other parts.

The greater the attorney's ability to state the broad invention in inclusive language, and which will yet fall within the disclosure, the more valuable the patent will be. The rare knack of disregarding details, and getting at the real kernel of the invention is here practically indispensable. It is through lack of such ability that many patents, otherwise sound, are vitally defective, and often in such manner as renders them uncorrectable later on. For when the patent issues, the inventor is presumed to have dedicated to the public every part and combination of the disclosure which he might have claimed as his own, but which were either claimed in more specific combinations, or not at all.

Writing the claims to fully protect an invention calls for super-inventive ability of a high order. In addition,

the attorney must have an absolutely accurate and complete vocabulary of technical terms, a thorough knowledge of the sciences, such as physics, chemistry and mechanics, and he must be fully versed in the intricate and voluminous decisions bearing upon claim construction in patents. For instance, he must fully understand that phase of the law called the "Doctrine of Equivalents."

#### **The Doctrine of Equivalents**

This doctrine gives the inventor certain additional protection over the exact wording of his claims, should they later come up in court for adjudication as to their scope, or inclusiveness. Its extent is in proportion to the inventor's advance in the art—that is, how basic or how specific an improvement his invention is, when compared with what has gone before. If his concept is far ahead of all others, and so quite basic, the wording of his claims, even if somewhat specific, may be held to extend considerably beyond their exact meaning, and so sometimes catch an infringer whose device may not exactly fit the claims as worded. If, on the other hand, as is usually the case, the inventor's concept is a minor improvement over the prior art, the Doctrine of Equivalents operates in his favor almost not at all, and he is held to be limited practically to the exact wording used in the claims.

Certainly, the safest plan to follow when writing claims, is to disregard any possible later help from this doctrine, and instead claim the invention as broadly as possible.

#### **The Claims Alone Give the Patent Protection**

It is well to repeat that the whole protection of a patent resides in the claims, and almost wholly without regard to what the description and drawings show, notwithstanding these last make up the bulk of the patent. But if this disclosure is not complete, or is found later to be inoperative, the patent is held to be invalid.

Another, but rarer, use of this disclosure, is as an adjunct to the claims. It helps to interpret and clarify them, particularly where there appears to be ambiguity or indefiniteness in their wording. Sometimes when such a patent is being litigated in the courts it is necessary to refer to the description or drawings to determine just what the claims are intended to cover, and whether the patent is infringed.

Mostly, however, the claims must stand or fall alone; so, the broader and more inclusive the wording, consistent of course with the real invention, and the greater the number of patentable combinations there are, each covered by a separate claim, the more protection does the inventor enjoy. If, for example, there are six elements, the combination of any two

or more of them might support a claim. Thus, let us refer to the elements by numbers. The combination of elements 1 and 2 may be one claim, elements 1 and 3 another, elements 1 and 4 another, elements 1, 2, and 3 another, elements 2, 3, and 4 another, elements 2, 3, 4, and 6 another, and so on. Where these various combinations represent a patentable combination, as distinguished from a mere aggregation, each is entitled to a claim. It is evident that the possible number of such combinations, even for a comparatively simple invention, might run into several hundreds. It is the duty of the attorney to choose from among these, the patentable ones that are really important, based upon his practical knowledge of what a competitor might seek to appropriate.

As to the wording of each claim, care should be taken by the attorney not merely to describe the detailed construction as shown, but rather to conceive a series of broad combinations in words which will cover it in a general or inclusive way. Thus, if an essential element of the combination is embodied in a lever, instead of using that word in the claim, the attorney might write "means for," and then follow with the particular basic function that such lever really performs, this function being essential to make the invention operate.

The broadest, or shortest, claims are better written first, and each should include only the essential combinations of a few different elements which do co-act to make a patentable combination vital to the success of the invention. Then to these same combinations are added additional elements which also co-act into a new patentable combination, and so on, until all the claims have been prepared.

#### **Short Claims Are Broad Claims**

Perhaps the most frequent mistake made by the inexperienced, in considering the value of a patent, is the belief that each of the claims should cover *all* the details shown. Just the opposite is true. The less the broad claims are confined to any of these details, the greater the protection. Hence, the necessity of but a few basic words, and the recitation of only a few elements in combination, in each of these claims, rather than many. More specific claims are also usually added to further protect the invention, particularly in case the broader ones should later be held to be invalid.

Usually then, the shorter a claim is, that is, the fewer words it contains, the stronger it is, and therefore the better does it protect the invention. In fact, sometimes only one extra limiting word will so reduce the amount of protection in a claim as to totally eliminate its value in the patent, from all practical viewpoints.



As a general thing, also, the more claims there are in a patent, the greater protection it gives, since the chance is greater of one or more of these claims being infringed. And the infringement of any one claim infringes the patent, and the patent owner can sue on such infringement to prevent competition, and so enjoy a profitable monopoly.

#### Many Claims Are Better Than a Few

The inventor is not unduly limited in the number of claims which his attorney may try to obtain in the patent. But recently the government has passed a law which charges the applicant one dollar extra for each claim over twenty filed in a new application, and also one dollar for each claim over twenty, issued in a patent. However, since the average number of claims issued in all patents is under seven, and since this number probably also represents the average number of claims filed in the original applications, it will be seen that this new law seldom restricts the inventor, since he can try to obtain nearly three times as many claims as is usual, before being charged an extra fee.

As many claims should be written as are necessary to fully cover each and every new combination of the elements of the invention. The purpose here is to so surround the original invention with claims to its different parts and combinations that it is impossible for anyone to come in through these various defenses and manufacture anything resembling the invention. The wider and more numerous these defenses are, the better is the central idea, which they surround, protected. This is readily understood when you consider how much more difficult it would be for a competitor to make something similar to your invention if he had to avoid infringing your patent by getting around successively a plurality of claims, say fifteen or twenty, than it would be if he had only one or two to design around.

Of course the practice of including many claims may be overdone, which is equally bad. This is called "multiplicity," and if persisted in, may result in a final rejection by the Patent Office Examiner, when correction can be made by cancelling the extraneous claims.

It is the author's firm belief that most patents are under-claimed, both as to the number of claims and their brevity. This statement is based upon the results of scores of infringement investigations of issued patents, which his clients did not infringe simply because the claims had not been broadly enough drawn, nor enough of the patentable combinations covered in additional claims, to protect all that the inventor had conceived.

(To be continued)

### The "B" Battery Problem

In many sound installations, particularly those which have been in for some time, "B" batteries are used as the source of vacuum tube plate supply and photocell polarizing voltage. These batteries consist of a number of small cells connected in series. Taps are brought out to binding posts to afford a range of voltages, and the entire assembly is placed in a cardboard box. Sealing compound is then poured into the box, covering the cells, in order to keep out moisture and dirt.

Batteries of this type are usually referred to as dry "B" batteries, although strictly speaking the term "dry" is somewhat misleading. The cells themselves are really wet, the electrolyte being retained in the form of a paste in the zinc container which is sealed at the top to prevent evaporation. Externally, therefore, cell appears dry.

In booths in which the room temperature is high the liquid in the cells somehow manages to evaporate, and

the batteries run down in a comparatively short time. It is good practice to test them frequently. Daily inspection is recommended.

A point to remember is that the voltage generated by a battery remains practically constant throughout its life. As the battery wears out, however, its electrolyte evaporates, its internal resistance rises, and as the current is drawn from it, the terminal voltage decreases. This is due to the fact that the internal resistance increases and must be subtracted from the constant generated voltage of the battery. The batteries should, therefore, be tested under load. A good rule to follow is that when a battery voltage has dropped 15% with the battery tested under load, the battery should be replaced.

The voltage of a "B" battery will sometimes drop prematurely, because one cell has gone bad. If the bad cell is between two taps, it can be jumped and the performance continued while a new battery is being obtained.

## Acoustics of a Flexible Space Theatre

(Continued from page 14)

and sound film producers as being the ideal sound absorbent.

#### Perfect Acoustics Obtained

From the foregoing discussion it is evident that excellent acoustical conditions are to be anticipated in each of the six specialized arrangements. The acoustical properties are almost entirely independent of the size of the audience, and the plan and section studies are notable for the absence of echoes, interfering reflections and sound foci. Furthermore,

a reinforcement of sound to the distant seats is actually obtained and the proper loudness is assured by the correct reverberation conditions, which is a function of the size of the room and quantity of sound absorbing material present.

The character of the specific sound absorbing interior finish which was provided is such that because of its "straight line" sound-absorbing characteristics, no detrimental effect upon the quality of speech and music will result.



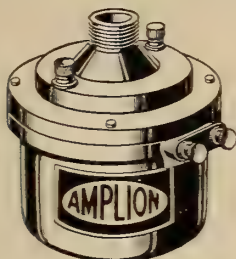
Fig. B. Plan of auditorium after acoustical treatment



## New Equipment and Appliances

### New Amplion Reproducer Unit

THE Amplion Products Corp. of New York announces this month the production of an entirely new type of reproducer unit called the Amplion Octophase. The unit operates on the dynamic principle as expounded by Sir Oliver Lodge, the principle of the piston diaphragm as



Efficiency of the Unit

taught by Edison, Stroh, Coombs and others, and the principle of phase relationship contributed by Eichmeyer, Taintor, Tigerstedt and Hensley. The manufacturers claim for the unit an unprecedented efficiency, a wide frequency range and the capacity to reproduce tremendous volume.

The construction of the Amplion Octophase is such that the area over a scientifically domed diaphragm encased in a scientifically shaped air chamber is divided into eight divisions. The centers of gravity of each of these divisions are exactly equidistant from the throat of the unit, and since all operate under identical pressures, the sound impulses from each division reach the throat of the horn in perfectly timed synchronism with the arrival of the sound impulses from all the other divisions. It is from these eight divisions that the new reproducer derives its name Octophase.

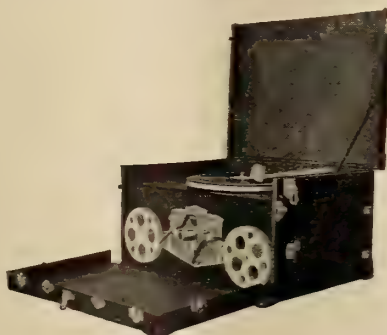
It is asserted by the manufacturers that the efficiency of the unit is from six to eight hundred per cent greater than that of cone speakers. Its light aluminum alloy diaphragm weighs less than 1/40th of an ounce. The diaphragm is propelled by a highly efficient coil in a magnetic field of great intensity. According to the manufacturers the efficiency of the unit is so high that its output volume exceeds that of the average speaker by an amount equivalent to that obtained by the use of an extra stage of amplification. This means that high sound levels are thus obtained with less audio amplification, thus permitting the operation of the amplifier well below the distortion level and as a consequence improving the tonal quality of the reproduced sound as well as increasing the life of the amplifier tubes.

### The New Portable "Talkiola"

A NEW portable 16 mm. projector and sound on record combination has just been developed by the Talkiola Corporation of New York. The

turntable used with the outfit will accommodate either standard or 16 inch talking picture records. The equipment is so designed that it is suitable for use in clubs, camps, hotels, schools, churches, sales conventions, etc.

A specially designed projector is an important feature of this new portable machine, which is so constructed that even a novice can thread the film with ease, and markings provided which enable anyone, even without technical knowledge or experience, to operate the equipment. By means of a patented automatic device, synchronism between film and record is immediately obtained upon starting the motor. The projector utilizes a 250 watt Mazda lamp.



The Portable Talkiola

The outfit is equipped with a 1/20th horsepower alternating current motor, constructed especially to the design of the manufacturer. This motor drives both the projector and the turntable. For talking picture work, the turntable operates at a speed of 33 1/3 r.p.m. A speed of 78 r.p.m. for playing records may also be obtained merely by shifting a lever. The desired speeds are attained by means of noiseless, non-wearing reduction gears.

### The Sound Equipment

The sound equipment employed in the "Talkiola" consists of an amplifier employing a screen grid tube in the first stage directly coupled to two 145 power tubes which are connected in push-pull and constitute the output stage. A 180-type full wave rectifier tube is used. The filtering system incorporates the principles of ultra-modern design and insures freedom from hum.

The electromagnetic pick-up is perfectly matched to the input of the amplifier. The output of the amplifier is connected to a dynamic reproducer. A hinged door at the side of the portable case permits the speaker to be taken out of the case and used at the other end of the room. A 25 ft. flexible cable is available for this purpose.

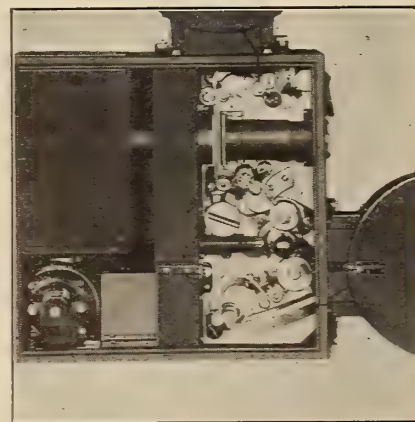
A medium size transparent screen is supplied as a part of the portable equipment. If desired, however, a 7 ft. by 9 ft. transparent screen can be supplied. This screen may be placed 25 feet from the projector.

The Talkiola Corporation claim that due to the high quality of the pick-up, amplifier and speaker and also to the careful matching of all impedances, the tone quality of this new Talkiola product is close to perfection. The equipment is enclosed in a handsome leather-finished case, 23" by 18" by 14" high. It weighs only eighty pounds complete with transparent screen and all necessary equipment. An interesting feature of the outfit is the fact that provision has been made for the use of a microphone by means of which the operator may address his audience.

### RCA Photophone Announces New Portable Equipment

AFTER more than a year of intensive research and meticulous development, RCA Photophone, Inc., announces the production of an entirely new Portable sound reproducing unit and has begun its manufacture on a large scale. Designed primarily to meet the ever-increasing demands in the fields of education and industry, the new apparatus has been constructed to serve in any capacity where Portable sound reproducing equipment can be employed to best advantage.

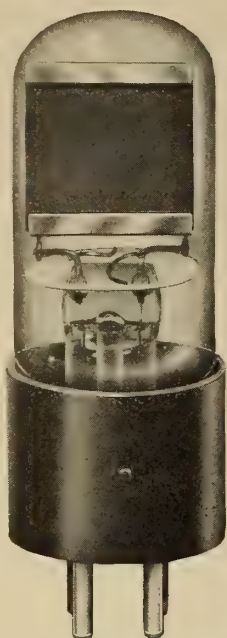
The entire unit comprises a projection machine, an amplifier, a loudspeaker and a carry-case for film and these have an aggregate weight of slightly more than 200 pounds. The projection machine is 19 inches high, 19 inches wide and its breadth is 10 inches. The amplifier, which is built in a carry-case having a removable cover, is 26 inches long, 8 3/4 inches high and 11 inches in breadth. The loudspeaker, which is of the flat baffle type, is contained in a carry-case, the dimensions of which are 8 1/2 x 19 x 14 1/2 inches.



RCA Photophone Projector

Standard 35 mm. film is used and adequate sound reproduction is obtainable in a room or hall having a content of 75,000 cubic feet when using the 8 inch direction baffle. A 6 inch dynamic cone speaker is supplied when the cubic content does not exceed 12,000 feet. A picture about





# Radiovisor Acoustic Bridge

*Guaranteed Unconditionally for  
ONE YEAR*

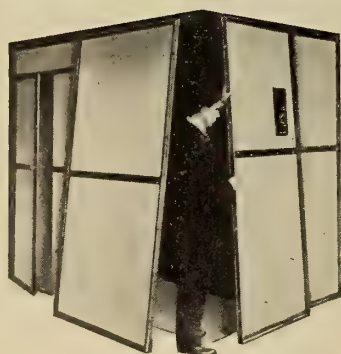
Radiovisor offers a Low Resistance, Highly Sensitive and Constant Acoustic Cell in which microphonics and background noises are reduced to a negligible factor. The Ruggedness, Simplicity of Construction, Greater Output and Longer Life of the Radiovisor Cell, ideally suits it for BETTER SOUND REPRODUCTION.

*Technical Data furnished on request*

**RADIOVISOR FOREIGN and COLONIAL, Ltd.**

202 EAST 44TH STREET

NEW YORK CITY, N. Y.



Both portable and permanent type

## STANDARD SIZES

4 ft. x 6 ft. x 7 ft. 1½ in. high  
6 ft. x 8 ft. x 7 ft. 1½ in. high  
8 ft. x 9 ft. x 7 ft. 1½ in. high  
9 ft. x 12 ft. x 7 ft. 1½ in. high  
9 ft. x 14 ft. x 7 ft. 1½ in. high

## PORTABLE AND PERMANENT FIRE-PROOF PROJECTION ROOMS

THESE booths are made of ¼" thick transite with angle iron 1¼" x 1¼" x 3/16". The panels are interchangeable and bolted together with stove bolts. The seams are filled with transite cement. The floor sheets are ¾" thick asbestos. The Underwriters throughout the country have approved these booths, as well as the fire and building departments of all cities. Special booths built to conform with the Rules and Regulations of the Steamship Inspection Service on United States Shipping Lines.

## BLUE SEAL PRODUCTS COMPANY, Inc.

Distributor for Johns-Mansville Asbestos Products. Also  
Manufacturer of Motion Picture Accessories since 1913

WRITE FOR CATALOG OF BLUE SEAL PRODUCTS

262 Wyckoff Street

Brooklyn, N. Y.

8 x 10 feet in dimensions is obtained upon the screen from a throw of 75 feet. The equipment is AC operated from an outlet of 105 to 125 volts, either 50 or 60 cycle, single phase power source. The total power required is approximately 12 amperes at 100 volts.

Connections between the various units are made by means of suitable cables fitted with necessary plugs and receptacles. For a complete set-up using one projector only four cables are required. One is for the power supply to the projection machine; one

for the power supply to the amplifier which may be plugged into a receptacle in the projector; one to connect the signal circuit of the projector to the amplifier and one from the amplifier to the loudspeaker.

The projector is designed to accommodate a one-thousand foot standard reel, a Standard Series I theatre projection lens with limits of focal lengths of 3¼ inches to 8 inches, a one-thousand watt, 110 volt, p.c.-focused base projection lamp, a 10 volt, 7½ ampere exciter lamp and a UX868 photo-electric cell.

## New Earl Carroll Theatre Has P. A. System

Earl Carroll's "Vanities" have adopted the Western Electric Public Address System for sound amplification and in doing so they are presenting to the public, for the first time, innovations that promise to revolutionize legitimate stage producing.

At the new 3,000 seat Earl Carroll Theatre, the largest house in the country for legitimate stage productions exclusively, a complete system of loud speakers was installed for the opening of the new "Vanities," Thursday night, August 27. Six loud speakers have been installed in the auditorium itself and 20 in other parts of the building.

The innovation is the result of demonstrations that have shown the lifelike amplifications of the human voice by this system and is being introduced by Mr. Carroll as part of his policy to provide mammoth musical productions at a reasonable cost to large sized audiences. The loud speakers will insure perfect transmission of sound from the stage to every part of the house.

Among the features that will be possible because of this innovation in the auditorium itself are:

- (1) A general reinforcement of music and voice from the stage;
- (2) A disappearing orchestra working on an elevator platform so that after the orchestra has descended to the basement, the platform can be replaced and used for the stage production while the orchestra's music is still audible to the audience;
- (3) Provision for individual features involving a specially constructed microphone arrangement, including a microphone that can be raised from alongside the footlights through a push spring operated by one of the actors on the stage. This microphone system permits various combinations of musical effects on and off stage;
- (4) The use of special records to reproduce off stage sound effects.

In addition to loud speakers in the auditorium itself, others, in dressing rooms and in the lobby will help evolve a general efficiency system.

In the lobby the loud speaker makes possible the curtain announcement for the beginning of each act.

The loud speakers in the dressing rooms will enable members of the cast to hear a continuous reproduction of the performance on the stage and will make it possible for the stage manager sitting in the wings to keep the players in their dressing rooms advised of the play's progress and of their cues.

The Public Address System installation at the theatre was made by Electrical Research Products represented by J. J. Way, Public Address System specialist, and by I. F. Durst, who supervised the work of installation.



### Technicolor Features Planned

Major companies are turning their attention to color films to a degree which presages a return of color during the 1931-32 season. The results obtained by Technicolor in development of its new grainless process have given impetus to color pictures at the studios. It now appears that between fifteen and twenty feature films, in addition to a number of short subjects, will be produced entirely in Technicolor during the coming twelve months.

Radio pioneered with the new Technicolor process in its current picture, "The Runaround" and was so pleased with results that another comedy, "Mom!", starring Edna May Oliver, also was done in color. The company now is said to be planning Technicolor filming for "The Bird of Paradise," "Marcheta" and "Babes in Toyland."

Paramount is going in for color also and has signed a contract with Technicolor for eight pictures. The first of this series will go into production within a month. In addition, Paramount will include 400-foot Technicolor sequences in its Pictorial beginning next month and will also release a series of short subjects produced by the Welshay organization.

Warners and First National will make a series of production beginning in October. At least four will be made during the coming year.

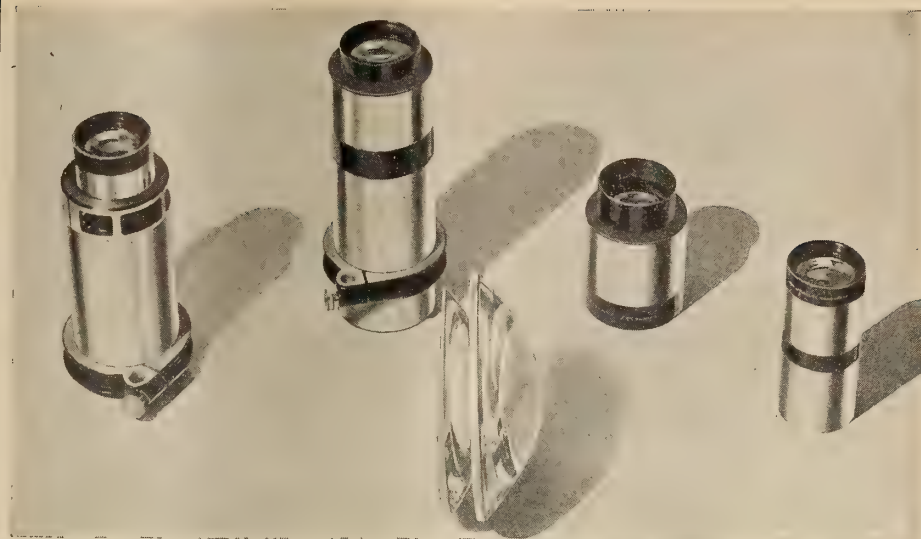
Metro-Goldwyn-Mayer is reported to be going forward with its big revue, "The March of Time," abandoned last year when musicals declined in popular favor. The same company also is negotiating for the production of "The Merry Widow" in Technicolor.

### New Organization for Distribution of 16 mm. Talkies

International 16 mm. Pictures, Inc., a new organization, has recently been formed which will, through 150 local exchanges, make available for rental to dealers a large variety of talking pictures at popular rentals. The new enterprise is cooperative and profit sharing and will include the manufacturers of equipment as well as the producers of film. The company has commenced operations and has engaged half of the tenth floor of the Film Center Building, 630 Ninth Ave., New York City. It is understood that Louis B. Mayer is personally interested in the new organization.

### News-Reel Theatre in Paris

A news-reel theatre has been opened in Paris. The name of the new theatre is the Cinema des Actualites. It is operated by "Le Journal," one of the leading French dailies.



## New Projection Efficiency

**S**UPER Cinephors are true anastigmats. They improve the image quality by overcoming astigmatism, spherical aberration and chromatic aberration. Pictures projected with Super Cinephors have maximum sharpness of detail, contrast between blacks and whites and brilliance of illumination.

50% more light is concentrated on the film by the new

B & L Condensing System. This overcomes loss of light due to reduction of reflecting area of perforated screens. For finest projection use this condensing system with Super Cinephors.

Catalog E-16 describes them and gives valuable information to the projectionist. Send for your copy now. Bausch & Lomb Optical Co., 680 St. Paul Street, Rochester, N. Y.



# BAUSCH & LOMB

### It's ROSCO Quality!

FILM CEMENT

FILMRITE "The Super Film Cleaner"

MOVIETONE FILM LACQUER

GELATINE SHEETS (Non-fading colors)

NOTE: If your supply dealer cannot supply you with the above, we will give you prompt service.

## ROSCO LABORATORIES

367 HUDSON AVENUE

BROOKLYN, N. Y.



**MORE DEPENDABLE  
THAN THE SUN**

**STRONG**

**HIGH INTENSITY  
AUTOMATIC REFLECTOR  
ARC LAMPS**

Delivers the light silently, automatically, assuring full, even screen brilliance with depth and definition.

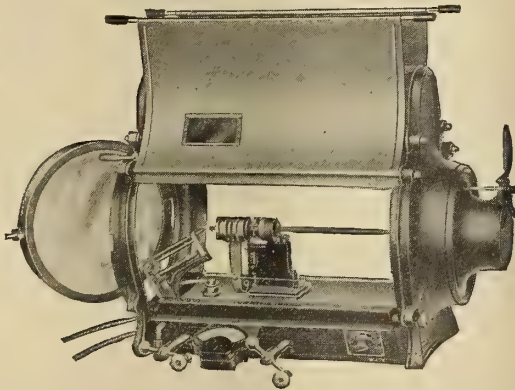
FOR SALE BY INDEPENDENT SUPPLY DEALERS

**The Strong Electric Corporation**

TOLEDO, OHIO

2501 LA GRANGE ST.

Export Office: 44 Whitehall St., New York City, N. Y.



**BEST CARBON SAVER**  
FOR LOW INTENSITY LAMPS



Saves jaws of Lamp as well as Carbon. Made in all sizes.

\$2.50 each at your dealer.

**BEST DEVICES CO.**

200 FILM BUILDING

CLEVELAND, OHIO

### Fox Decentralizes

Abandonment of the chain system of theatre management by the Fox Theatre Corporation was announced recently by Harry Arthur, general manager for the corporation. Decentralization of the system will affect some 200 houses which will be grouped into districts about equivalent to the territory served by the film exchanges. Each district will be placed in charge of a general manager.

Mr. Arthur, in making this announcement, stated that the move was expected to result in a large saving, as well as raise the standard of theatre operation. The theatres involved are all located in the East.

"We are confident that great economies will result from the new system of management," Mr. Arthur said. "Under the new plan every theatre will have the most intensive supervision. Complete responsibility will be placed on the general managers, who in most instances will be within a few hours of every theatre in their territory. The result will be very largely to decentralize and to localize theatre groups. In many instances those local interests which once were represented on the board of directors and who, to a large extent, still are stock holders of the subsidiary exhibitor companies will be invited to resume that contract.

### A Stimulus to Producers

"The new arrangement should also prove a stimulus to all producing companies. Under the system in general use heretofore, district managers and theatre managers were compelled to use whatever pictures were made by the controlling producer. Under decentralized management, studios will be stimulated to produce more pictures that will stand on their own merit."

According to Mr. Arthur's announcement, a few of the larger theatres will be operated as separate units, virtually all of the excessive cost of the home office will be at once eliminated, and the headquarters will have more to do with service than with operation. The Fox West Coast Theatres are not to be affected by the change, it is reported.

### Theatres in Europe

There are approximately 27,000 theatres in Europe with an aggregate seating capacity of about 12,000,000 people. About a score of them have a seating capacity of over 3,000. More than 18,000 theatres (a good proportion of which barely qualify as motion picture theatres) have a seating capacity of less than 500. The average cinema capacity in Europe is less than 450.



## Some Facts About Synchronous Motors

**T**HE speed of a synchronous motor is dependent upon the frequency of the power supply. The motor derives its name from the fact that it runs at a speed corresponding to, or proportional to, the generator which supplies the alternating current for its operation. Synchronous motors can be designed to run at different speeds from the generator by constructing them with a different number of poles. A synchronous motor having two poles will run at a speed of 3600 r.p.m. A machine having four poles will run at 1800 r.p.m., while a six pole machine will maintain a speed of 1200 r.p.m.

Citing the four pole three phase synchronous motor as an example, the action involved is as follows: When the three phase alternating voltage is applied to the windings of the motor, a magnetic field is created. This magnetic field rotates at a constant speed, providing the frequency of the power supply is constant, which is generally speaking the case. The speed at which the magnetic field rotates is such that it passes over two poles for every complete cycle of alternating voltage. Therefore, two cycles are required for each revolution of the magnetic field around the motor.

### Rotating Field Defined

In using the words "rotating magnetic field" it must be understood that this does not refer to a rotation of mechanical parts, but to a rotation of magnetic lines of force. These magnetic lines of force are set up by the current in the stator windings of the motor. Each phase has a separate winding for each pair of poles. Successive

spacing is used in placing the phase windings around the circumference of the stator, so that the three windings (phase windings) cover two poles or one-half the circumference in the case of a four pole machine. There would, therefore, be six separate windings for a four pole motor of this type.

The voltage waves of the separate phases are not in unison, but follow one another at equal time intervals. Magnetic lines of force are produced successively around the stator by the phase windings and the effect of a rotating field is produced. This rotating field acts upon the rotor of the motor causing it to revolve at the same speed as the magnetic field rotates around the stator.

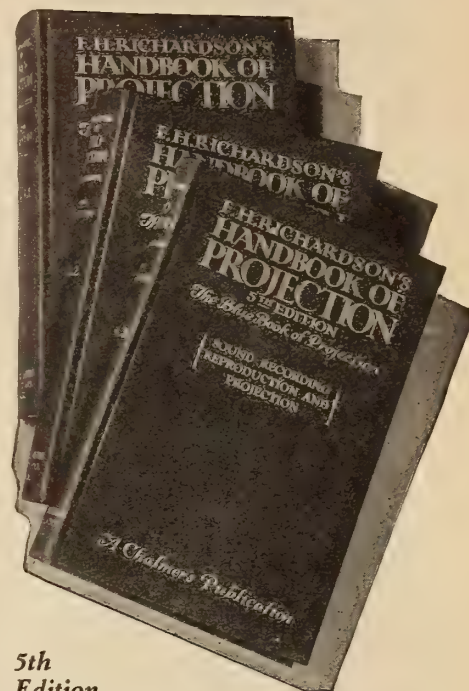
The extremely uniform speed maintained by the synchronous motor makes it a highly satisfactory method for driving motion picture projectors which are equipped for sound reproduction. The uniform speed maintained by synchronous motors is due to the fact that their speed is dependent entirely upon the frequency of the power supply and is not affected by variations in line voltage.

Power companies maintain the frequency of their power lines within very close limits by means of sensitive governors on the generating equipment at the power house. Moreover, even if the frequency of the power supply does vary a cycle above or below normal, the change of frequency takes place very slowly due to the great weight of the power house generator. A change of projector motor speed will, of course, change the pitch of the reproduced sound, but such changes are not discernable if the change of pitch takes place slowly.



Port Huron Local 622 All-Union Baseball Team. Top row, reading left to right: Marcus Burleigh, William Jahr, James Ort, Lloyd Cassin and Irving Hawes. Bottom row: Jack Cassin, Harold Bussey, Floyd Van Conant, Fred Sharlow and Reginald Rothaermel

## THE BEST SELLER



5th  
Edition

### HANDBOOK OF PROJECTION

By F. H. Richardson

Back in 1910 Mr. Richardson wrote the first Handbook of Projection. It was a sell out. Second, third and fourth editions, each bigger and more successful have followed. The present fifth edition in three separate volumes, illustrated above, is the culmination of years of intensive effort.

Richardson is no swivel chair author. He knows the problems of the field—meets the men on their own ground. His books reflect a practical knowledge of just what information is needed. Recently he completed a 17,000 mile trip through the U. S. and Canada in the interests of projection.

### CONTENTS

Volumes I and II are devoted entirely to the general subject of projection and everything related to it. Volume III deals exclusively with sound projection. All three volumes are profusely illustrated and contain over 1,400 pages of projection information written so you can understand it clearly. Each volume contains Richardson's famous question and answer index giving immediate access to hundreds of different problems.

These are the books which are being used by projectionists and theatre managers all over the world to secure improved results. Send for this finest of projection libraries today.

### USE COUPON TO ORDER

CHALMERS PUB. CO. (M)  
516 Fifth Avenue, New York, N. Y.

Enclosed find (check) (money order) for \$10.25. Send Richardson's 3 volume Handbook of Projection to .....

### WINNIPEG, CANADA

J. M. RICE & CO., J. M. Rice, Prop. Leading equipment dealers in all kinds of projection room equipment facilities. Representatives of leading equipment manufacturers of the United States and Canada. All our merchandise guaranteed for performance and stability. Whatever you want we will supply it.



## SYNCHROFILM MODEL J SOUND EQUIPMENT

Weber Machine Corp. was first to recognize the needs of the small theatre for a first class sound equipment equal to the best, but at a price in keeping with its abilities to buy and still keep reasonably on the black side of the ledger.

Weber Synchrofilm quality has been recognized from the very beginning. It is among the leading sound equipments, yet is sold at a low price and absolutely free of all extra charges, such as service, fees etc.,

Model "J" is the most advanced. It is already in daily use in many projection rooms throughout the country.

**\$275.00 per pair**

*Price and Particulars on request.*

### WEBER MACHINE CORP.

59 RUTTER ST., ROCHESTER, N. Y.

Export Dept., 15 Laight St., N. Y. C. Cable, "Ariab," New York

### Television Official Here

In order to arrange for mass production of television sets in the United States, Sidney A. Moseley, a director in the Baird Television Corporation of London arrived Aug. 19th on the North German Lloyd steamship Bremen. He was accompanied by Leon Osterweil, who represents the American financiers interested in the business.

Mr. Moseley stated that it was the intention to have American manufacturers produce 1,000,000 television sets a year and there was no reason why they could not be sold as easily as radio sets. They will be the Baird patent commercially built television sets, and will have the modulated light used in the English market instead of the neon light. Mr. Moseley said that the light was of unparalleled brilliancy, showing faces on the screen with the features accentuated clearly. A play with three characters has been done successfully by the Baird Television in London, Mr. Moseley stated. It is understood that the new television set is to be approximately the size of a three-tube radio set and is to be equipped with a screen about eight inches square. The price of the outfit is to be under one hundred dollars.

### Arc Products Put New Portable on Market

The Arc Products Corp., a new equipment company, which has just established headquarters in New York, announce a new portable projector for black and white or natural color, adaptable for sound on film or sound on disc. The new projector is known as the Vocolor. Assembly or disassembly of the outfit can be accomplished in five minutes, the equipment fitting into two rectangular cases with a total weight of less than 160 pounds. This permits the handling of the equipment for any distance by a man with a small car.

Long range "throws" is claimed for the equipment, which shows color pictures the dimensions of which are equal in size to black and white. An attractive feature of the outfit is its complete flexibility, permitting the change from black and white to color, or vice versa, at will. The normal speed of the machine for color projection is the same as for projection in black and white. The equipment is simple in construction, making for ease of operation, and the outfit is attractively priced.

### When the Amplifier "Squeals"

"Squealing" in an amplifier is often due to the fact that one of the push-pull stages is unbalanced. Before attempting an elaborate autopsy, try a new tube or two in these sockets and see if the trouble is remedied.


# SOUND REELS

For Perfect Projection

**ALL-WELDED TYPE**  
One Unit

**LASTING DURABILITY**  
Bright Cadmium Plated

**UNIVERSAL ELECTRIC**  
9-16 Thirty-seventh Ave.,



—All Sizes—

**DEMOUNTABLE TYPE**  
Each side one unit

**ALL PARTS  
REPLACEABLE**

Write for quotations

**WELDING COMPANY**  
Long Island City, N. Y.

**Give This to Your Friend—Have Him Fill It in and Mail to us at Once**

The Motion Picture Projectionist  
45 West 45th Street, New York City

Gentlemen:

Enclosed please find \$2.00 for which enter my subscription for one year (12 issues) starting with.....issue. (Two years, \$3.00.)

Name .....

Street ..... State .....

City ..... Local No. ....



### New Company Formed

The Telephoto & Television Company of New York has been incorporated under the laws of the State of Delaware for the purpose of taking over the Telephoto Corporation of New York. This latter company has been engaged in the manufacture of photoelectric cells and television tubes for the past eighteen months at its factory at 133 West Nineteenth Street, New York. Its products have been sold to Paramount Publix Corporation, Universal Sound Systems, the Sterling Motion Picture Company, the Pulverman Corporation and many others in the sound field.

It is the intention of the Telephoto and Television Company to increase the manufacturing facilities for its products, as the demand greatly exceeds its present capacity. Among other products, the company is manufacturing photoelectric cells of the caesium argon type. In addition to their use in the sound equipment field, these cells are used in photo-engraving, color matching, smoke detection and in many other ways. The Telephoto & Television Company is now in touch with the engineers of one of the largest photo-engraving concerns in the United States, which company, it is said, will adopt the cell exclusively.

### 1,000 Dark Houses to Open Labor Day

It is estimated that a minimum of 1,000 theatres which have been closed for the summer are scheduled to reopen on September 7th. While the exact number of houses now closed is not known, it is stated that many will not reopen with the new season. This is largely attributed to the fact that numerous theatres throughout the country have become antiquated or have been allowed to fall into such a state of disrepair that their renovation is not financially practicable. There is, however, a possibility that a number of the smaller houses will be reopened by exhibitors in search of new additions.

It is anticipated that the number of theatres operated by independents will be increased considerably, according to close observers of the situation. There has been a marked trend on the part of the unaffiliated theatre owners toward the acquiring of houses from the major circuits, and indications are that the movement will continue. In a number of instances the circuits are disposing of only one-half interest in their houses but with the provision for management by the independent exhibitor.

## FREE from DISTORTION!

ALL seats are equally GOOD with a

## VISIBESTONE

THE PERFECT FIREPROOF SOUND SCREEN

### FEATURES

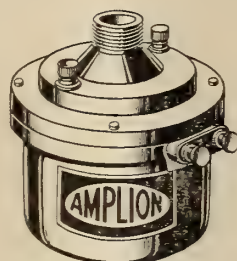
1. Fireproof
2. Free from distortion of sight and sound
3. Acoustically perfected
4. Eliminates "sound pockets"
5. No glare—restful to the eyes
6. Easy to clean—lasts longer

Solves a problem for the projectionist who is concerned about what happens to his "work" after it leaves the projection room. Here is an acoustically correct Sound Screen with all the requirements for perfect projection. An investigation will convince you.

For sale at all National  
Theatre Supply Com-  
pany Branches

Approved by E. R. P. I.

**KEASBEY & MATTISON COMPANY**  
AMBLER, PENNA.



## A New Amplion Unit! The OCTOPHASE

In the OCTOPHASE, the space between a scientifically domed piston diaphragm of great rigidity but extreme lightness, is divided into eight divisions with 3 sections in each division, 24 sections in all. Channel ways are provided for conveying the sound impulses from these 24 sections to the throat of the horn. Space and time relations are so designed that the impulses from each section reach the throat of the horn at the same moment in perfect synchronisms with each other. The impulse from each division adds to the effect in the same direction and at the same time with all the others building up the combined sound im-

Greater Efficiency  
Greater Range  
Greater Volume

pulse of all and preventing any conflict of sound caused by pressure from one portion of the diaphragm working against rather than with the pressure from other portions. By means of this construction there is realized great efficiency, greater frequency range and the ability to reproduce tremendous volume without blasting. Music is reproduced in its full range and speech is reproduced with a finesse that retains every shade of human emotion.

Write for further interesting details

**AMPLION PRODUCTS CORP.**

38 West 21st Street

New York

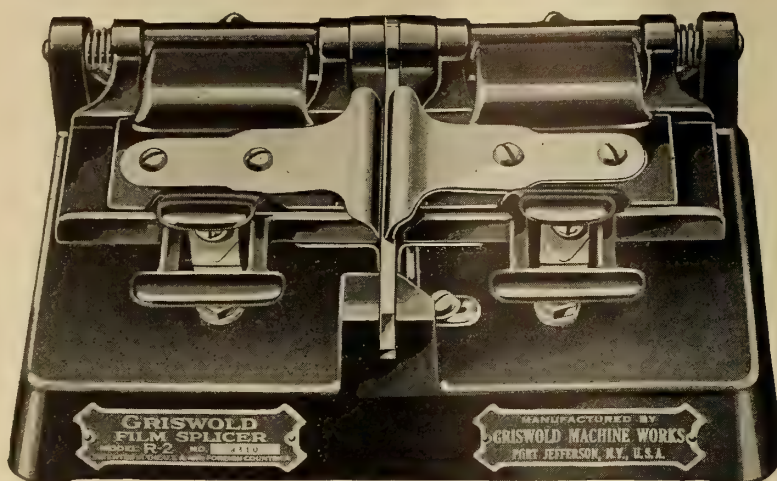
### S. M. P. E. Meet to Have New Apparatus Show

An exhibition of newly developed motion picture apparatus will be a feature of the approaching S. M. P. E. Convention to be held at Swampscott, Mass. The exhibit will be similar in character to that held at the Society's meeting at Hollywood last spring. All manufacturers of equipment are invited to display their newly developed products at the con-

vention and are urged to communicate with regard to this with the Editor-Manager, at the General Office of the Society, 33 West 42nd Street, New York City.

The exhibit will not be of the same nature as the usual trade exhibit. There will be no booths although each exhibit will be allotted definite space by the Apparatus Exhibits Committee and all exhibits will be arranged in one large room. All exhibition space will be furnished gratis.





*Known  
and used the  
World Around*

**M**ORE than 15,000 Griswold Film Splicers are in constant daily use throughout the world. For years the perfect splice has been made with a Griswold. Griswold is the standard film splicer for efficiency, durability and economy.

## GRISWOLD MACHINE WORKS

Port Jefferson, L. I.

New York

## Universal Film Splicing Machine

MODEL NO. 3

Pat. March 22:22

First-Class Results on New or Old Film

Permanent Gauge

No Adjusting

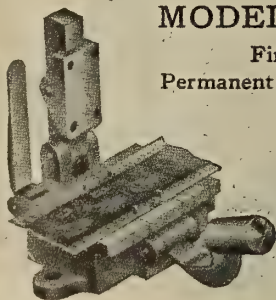
FOR THEATRES, EXCHANGES  
LABORATORIES, SCHOOLS

**Price \$6.00**

GENERAL MACHINE CO., INC.

816-826 East 140th St., NEW YORK, N. Y.

For sale by all Supply Dealers



## Another Opinion on Changeovers

EDITOR, *Motion Picture Projectionist*

Sir: I have been very much interested in the different opinions published in your magazine regarding the different types and methods used in making changeovers. I trust that I may be allowed to voice my opinion also.

The click should not be considered as a suitable means for changeovers. Very often the click strips cover the recording on the sound track resulting in a slight but noticeable jump in the sound or dialogue. It also serves as another means for noise in the sound system.

Next comes the cue meter. Very good on new prints but not so hot on old prints.

Then we have the dots. They should be ruled out entirely. The only difference between the dots and the much cursed punch marks is that the holes are apparently covered with black stickers. For example the picture, "Confessions Of A Co-Ed!" Several of the scenes on the ending of the reels were of a girl making entries in a diary. The entire screen was bathed in a white light when suddenly, zip, the dots appeared—Not very nice I must say. The dots are much too prominent and again I say out with them.

In my opinion the spoken or descriptive cue is the best for it in no way offers anything to distract the attention of the audience. The Projectionist must train himself the same as an actor on the stage. The actor stands off stage awaiting his cue to enter, wouldn't it be a nice performance if a shot would have to be fired or a bell rung to give the actor his cue. He of course has rehearsed his part and knows it to perfection. Theatres fortunate enough in having a pre-view should consider this as a rehearsal for changeovers as well as fader settings. Theatres not having pre-views of which there is a vast majority should consider their first showing as a rehearsal. A Projectionist that is constantly muffing cues should be discharged as being incompetent.

Yours for the return of the cue sheet,—S. Santorelli, *Projectionist, Jersey Theatre, Morristown, N. J.*

## G-M Announces New Cable

G-M Laboratories, Inc., 1735 Belmont Ave., Chicago, announce the perfection of a new cell coupling cable for use in sound equipment. This cable has five times the capacity reactance of standard microphone cable so frequently used in sound equipment and in addition, is highly non-microphonic.

The use of this cable reduces the attenuation of high frequencies.

**KEEP all your COPIES of  
MOTION PICTURE PROJECTIONIST  
AS A REFERENCE FOR CURRENT  
AND FUTURE NEEDS—PRE-  
SERVE THEM IN A  
BINDER**

**\$2<sup>00</sup>**  
**each**

GOOD SOLID  
IMITATION LEATHER  
—GET ONE

ORDER FROM THE MOTION  
PICTURE PROJECTIONIST

**BINDERS**



## Hays Lauds Cowan's Book

The leading executives of the motion picture industry have given high praise for the compilation and sponsorship of "Recording Sound for Motion Pictures" by the Academy of Motion Picture Arts and Sciences. The book, which includes chapters by the outstanding sound engineers and technicians of Hollywood, was edited by Lester Cowan, executive secretary of the Academy.

Among statements by industry leaders stressing the value of such an authoritative symposium of technical material, the following letter from Will Hays, president of the Motion Picture Producers and Distributors of America, Inc., has been received by William C. de Mille, president of the Academy:

"Dear Mr. de Mille:

"With very great interest I have seen a copy of 'Recording Sound for Motion Pictures.'

"The complexity and immensity of the problems arising out of the advent of sound none realizes more fully than the industry's engineers and technicians. And to the effective solution of those problems none has given more enthusiastic labor—to the end not only that the problems immediately at hand might be solved, but to the advancement of the whole great body of science itself.

"It is in that spirit that these papers have been prepared. The writers are men burdened daily with numerous practical problems, the solution of which cannot, in the very nature of our industry, be delayed, yet out of their few leisure hours they have taken time to record, for the benefit of their fellows, the latest and most-approved technical methods.

"To them the industry owes its sincere appreciation.

"With personal regards, I am  
"Sincerely yours,  
(Signed) Will H. Hays."

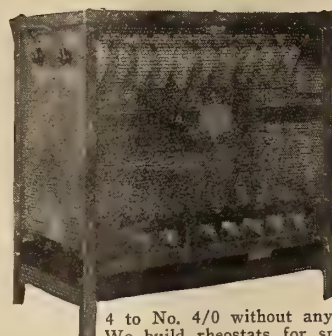
## Hall & Connolly Sales Show Increase

Hall & Connolly Inc., the well-known manufacturers of high intensity projection equipment and arc lamps announce that current sales are eminently satisfactory. Not alone with respect to domestic sales, but with respect to the export market, the firm has experienced a marked increase in the number of orders received. The German market has been particularly active, according to a report recently issued by the Hall & Connolly organization. New of this character is cause for rejoicing throughout the industry as it presages well for business during the coming winter.

# Hoffmann-Soons

## PERFECTION

### Best by Test!



Extravagant claims are easily made, but performance proves the worth of any equipment. Hoffmann-Soons Rheostats prove their worth by performance—in operation daily all over the world these rheostats demonstrate their superiority in the manner that counts—best by test!

**THE ONLY UNION MADE RHEOSTAT**

*Recognized as standard equipment in thousands of theatres and by theatre chains.*

Now equipped with solderless, adjustable lugs to take wire sizes from No. 4 to No. 4/0 without any additional cost.

We build rheostats for special requirements. Communicate with us Direct. There is no obligation.

Sold by all Branches of NATIONAL THEATRE SUPPLY CO., SAM KAPLAN, NEW YORK, CONTINENTAL THEATRE ACCESSORIES, and by your dealer.

**HOFFMANN-SOONS**

Electrical and Engineering Corporation

387 First Ave., Mfg. Division, New York

Contracting Electrical Engineers—Moving Picture Theatre Electrical Specialists

# RHEOSTATS

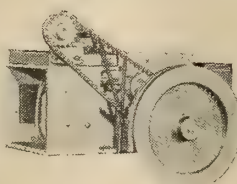
## BUY SOUND-ON-FILM NOW!

Through an arrangement with the World's Largest Independent Sound Equipment Manufacturer we offer for the first time

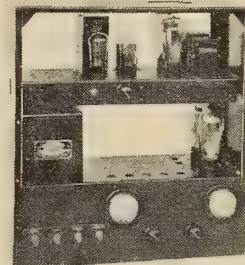
AN ALL A.C. OPERATED SOUND FILM SYSTEM  
AT THE STARTLING PRICE OF

### \$395.00

COMPLETE



This price for theatres seating up to 500. For theatres up to 2,000 seats, \$100.00 additional, this providing meters and changeovers.



Deliveries on Powers or Simplex start August 1st

NOTHING ELSE TO PURCHASE—NO BATTERIES—NO GENERATOR—  
INSTALLED IN A DAY'S TIME

Complete with Sound Heads, Main Power Amplifier, Speakers for Stage and Booth, Meters, Volume Control, Tubes and all Necessary Connections.

**S.O.S. SPECIAL SOUND-ON-FILM HEADS**

SOUND HEADS COMPLETE WITH DRIVES—PHOTO CELLS—  
OPTICAL SYSTEMS—EXCITER LAMPS AND ALL WORKING PARTS **\$247.50**  
PER PAIR



**SERVICE-ON-SOUND CORPORATION**

Dept. MP

Suites 607-609, 1600 BROADWAY  
NEW YORK CITY

Cable Address—SOSOUND, New York



## Deal with SPECIALISTS

Get our interesting prices "On Your Projection Needs" as advertised in this publication before placing your order.

**AMUSEMENT  
SUPPLY CO. INC.**

630 Ninth Avenue, New York City

### MR. PROJECTIONIST:

Good projection is up to you. Insist that the screen is kept in first class condition. You know the best equipment is useless if the screen is old or dirty.

After all, good Projection is only as good as your Screen . . . Our Screens "clinch" good projection.

*A Screen for Every Type of House*

**Chromolite**  
Sound Screen  
Non-Glare • Diffusive

**Vocalite**  
Sound Screen  
CRYSTAL BEADED

**Superlite**  
Sound Screen  
Perforated-White-Diffusive

**Silverlite**  
Sound Screen  
MORE LIGHT • LESS CURRENT

**BEADED SCREEN CORP., Roosevelt, N. Y.**

Write for Samples and "Getting the Light You Pay For"

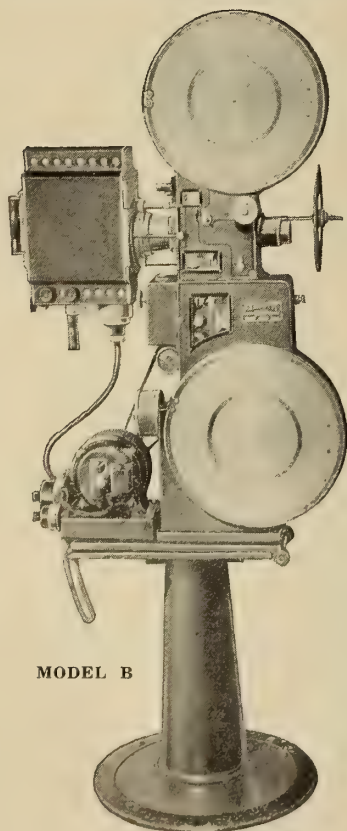


*if* you want to improve your sound permanently, try a Visitron Photoelectric Cell. With this LONG LIFE cell you'll marvel at the brilliant tone reproduction you get. It definitely ends your cell-worries. Ask the National salesman for a demonstration.



**PHOTOELECTRIC CELLS**  
**VISITRON**  
REG. TRADE MARK

**GM LABORATORIES INC**  
1733 BELMONT AVE. CHICAGO, ILL.



MODEL B

## The ROYAL ZENITH—

is the finest example of a sound projector manufactured today. It constitutes the most rigid engineering principles, making it a perfect machine, equalled by none.

To hear its smooth and quiet operation and its perfect sound reproduction is to convince one that perfection has been reached in this particular craftsmanship. You will like its looks, too.

THE ROYAL ZENITH MODEL B (illustrated herein) is built for heavy duty. It will withstand the continuous grind so essential in a sound projector for everyday theatre work. It is sturdy and dependable.

The ROYAL ZENITH MODEL A is the portable type with removable legs, light in weight, however possessing the same sturdy sound and projection mechanism as MODEL B.

The ROYAL ZENITH MODEL C is a valise type, having the same sturdy mechanism—only weighs 55 pounds—which makes it exceptionally portable, simple in its operation, and yet as dependable as the other models.

AMPLIFICATION can also be furnished with ROYAL ZENITH projectors, whether for theatrical or non-theatrical purposes.

Royal Zenith projector prices are interesting; write or wire for full particulars to Projection Department.

*Sound manufacturers, distributors and agents.*

**Pulverman Corporation**

Write or Wire for Full Particulars  
to Projection Department

Western Factory  
DULUTH,  
MINNESOTA

Executive, Sales Offices and Factory  
109 WEST 64th STREET  
NEW YORK CITY

Cable Address  
"CREMONIM"  
ABC 4th & 5th Edition  
Western Union



## Pulverman Corp. Speeds Up

Among the recent installations made by the Pulverman Corporation, manufacturers of Royal Zenith sound projectors and sound equipment, are double projector installations aboard the French Line steamships France, Isle de France and Paris. The equipment included the well-known Zenith Model "A" portable projectors which form an attractive unit of the Royal Zenith Line.

The Royal Zenith is a straight feed sound projector for 35 mm. film. The sound-on-film mechanism is built in as a part of the projector itself. The film is entirely enclosed as it passes through the machine from the upper magazine to the lower one. The mechanism is divided into sub-assemblies which form individual units of the complete assembly, and all parts are easily accessible for oiling and replacement.

The lamphouse used with the equipment is designed for use with Mazda lamps. It is double walled throughout and of ample dimensions, thus affording liberal air circulation for cooling the reflector, condenser lenses and lamp. The lamphouse is detachable in order to facilitate the portability of the projector. A low intensity arc lamp has also been developed recently for use with the projector.

### The Amplification System

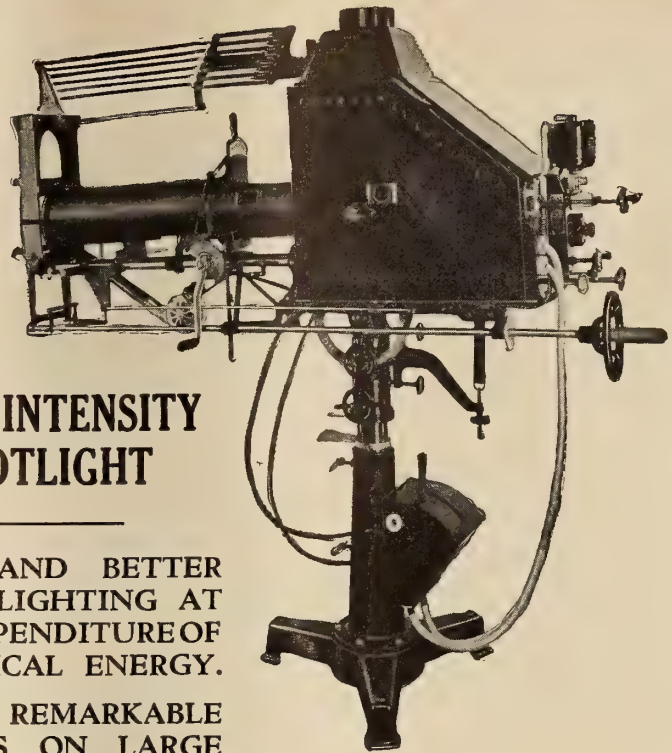
The amplification system which the manufacturers are prepared to furnish includes an amplifier, a non-synchronous phonograph for the reproduction of 78 r.p.m. records, an exponential horn and a theatre type dynamic speaker unit.

The amplifier consists of a pre-amplifier and a main amplifier contained in one metal cabinet. The dimensions of this cabinet are 32 inches high, 12 inches deep and 16 inches wide. A control panel is provided on the top of the cabinet. On this panel are mounted the fader switch, control switches and the necessary provisions for the connection of non-synchronous phonograph and monitoring speaker equipment.

### An Up and Coming Field Force

It is interesting to note that James Craig, a sound engineer of the Pulverman Corporation, recently covered the distance between New York and Kingston, Jamaica, by airplane in thirty-two hours. Mr. Craig completed five installations for the Palace Wilcox-Saenger Co., Ltd., of Kingston.

The Pulverman Corporation also announces a new addition to its line in the form of a "valise" type portable projector, which will be ready for distribution in the early part of September. Royal Zenith projectors may be purchased either with or without the additional sound equipment.



## HIGH INTENSITY SPOTLIGHT

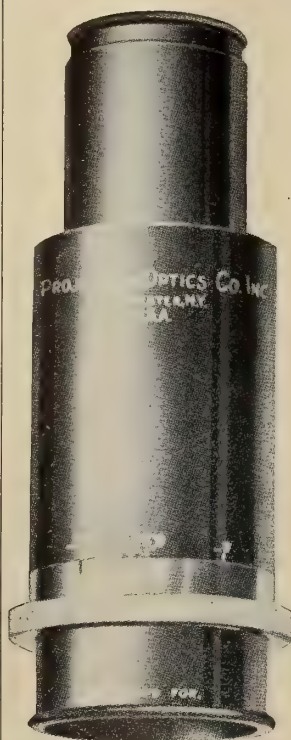
MORE AND BETTER  
STAGE LIGHTING AT  
LESSEXPENDITURE OF  
ELECTRICAL ENERGY.

MOST REMARKABLE  
RESULTS ON LARGE  
STAGE SETS.

**HALL & CONNOLLY, INC.**

24 Van Dam St.

New York, N. Y.



## SUPER-LITE LENSES

WISELY CHOSEN BY  
AMERICA'S BEST THEATRES

### New Bifocal Super-Lite Lens

An adjustable focus lens with a wide range of foci for both silent and sound film.

### Series III. Super-Lite Lens

Standard full Half-Size lens furnished in short focus as low as 4" E. F. and up to 10" E. F.

### Series IV. Super-Lite Lens

Full 3" diameter lens to meet the demand for more light for longer throws. 6" E. F. to 10" E. F.

*Quality Guaranteed*

**PROJECTION OPTICS CO., INC.**

330 Lyell Avenue

ROCHESTER, N. Y.

U. S. A.



## Good Projection Requires Good Rectification



M. P. 25-25

Good Rectification Means

## FOREST RECTIFIERS

**T**HIS Forest Rectifier meets the demand for a single unit to supply direct current for two projectors, and will furnish 15 to 25 amperes to either projector continuously.

It supplies a steady direct current, free from pulsations, and will produce a better light than other current supply devices. The only wearing parts are the bulbs which will last at least one thousand hours and usually much longer since only two bulbs are being used at a time (except during change over) and the load is alternately carried first by one set of two tubes then the other two as the projectors are alternately used.

This Forest Rectifier embodies the use of four rectifier tubes which are connected to supply current to two direct current circuits independent of each other, thus preventing loss of current at the first arc when the second arc is struck.

Both arc can be operated at the same time during the change over period and there will be no diminishing of the light from one projector while lighting up the second.

Two Ammeters are mounted on the unit which will show at a glance the amperage being used at either arc.

Links are provided for operating from 110-220 or 240 volts.

**Rectifiers for all purposes made in 15 amp., 25-25 amps., 30, and 65 amps. sizes.**

*We are specialists in our field. Send us your technical problems. Literature on request.*

## FOREST ELECTRIC CORP.

New and Wilsey Sts.

Newark

N. J.

## Outline of Sound Recording

(Continued from page 21)

editions of the dog-houses formerly provided for the camera man. They are, however, furnished with the same equipment used in the monitor room.

### Analogous to Audience

Since the monitor represents, in a way, the theatre audience, he must first be provided with a loudspeaker which reproduces the sound being recorded. To adjust properly these currents, should such adjustments be needed, he is provided with a little dial known as a volume control and with a little meter known as a volume indicator meter. The exact operation of this will be described after the discussion of amplifiers. By means of this volume control the monitor is able to adjust the currents to their proper value. Not that this adjustment is made frequently, for, particularly in dialogue, it is quite possible after reasonable rehearsal to make such an original adjustment that no further change in the volume control is needed during the take.

### The Mixer Panel

As in some cases, although this is more infrequent than it used to be, two or three microphones may be used, there is inserted in the circuit previous to the volume control a mixer panel from which the monitor man takes his other name. This mixer is simply a set of three or more volume control dials so arranged that the currents from each of the microphones may be adjusted to the desired volume and then automatically brought together to make a single current which, of course, produces a single record.

(To be continued)


## New Sound Process

A Czechoslovak cinema technician, Knotek, is working on a new sound film apparatus, which is claimed by Prague professional circles to revolutionize existing patent devices. With the apparatus invented by Knotek, the sound is electrically recorded on the film on two different tracks and can be immediately reproduced without any complications. The apparatus can be immediately reproduced without any complications. The apparatus will cost only from 250 to 300 dollars. In addition to this recording apparatus, Knotek intends to turn out a camera which can at the same time be used as a projection apparatus and by means of which unperforated films can be projected. It is stated that the invention has been acquired by a Berlin financial group for exploitation in Germany.

## Index of Advertisers

Amplion Products Corp. ....	37
Amusement Supply Co. ....	40
Bausch & Lomb Optical Co. ....	33
Beaded Screen Corp. ....	40
Best Devices Co. ....	34
Blue Seal Products Co. ....	32
Brenkert Lt. Project. Co. ....	4
Chalmers Publishing Co. ....	35
Eastman Kodak Co. ....	5
Fish-Shurman Corp. ....	5
Forest Electric Corp. ....	42
General Machine Co. ....	38
G-M Laboratories, Inc. ....	40
Griswold Machine Works ....	38
Hall & Connolly, Inc. ....	41
Hoffman-Soons, Inc. ....	39
Ilex Optical Co. ....	Front Cover
International Projector Corp.,	Back Cover
Kaplan, Sam, Mfg. & Supp. Co. ...	2
Keasbey & Mattison Co. ....	37
Movie Supply Co. ....	42
National Carbon Co. ....	3
National Theatre Supply Co. ...	43
Projection Optics Co. ....	41
Pulverman Corp. ....	40
Radiovisor Foreign & Colonial	
Ltd. ....	32
Rice, J. M., & Co. ....	35
Rosco Laboratories ....	33
Roth Bros. & Co. ....	6
Service-On-Sound Corp. ....	39
Strong Electric Corp. ....	34
Universal Elec. Welding Co. ....	36
Weber Machine Corp. ....	36
Weston Electrical Instrument	
Corp. ....	4

**THEATRE EQUIPMENT**  
NEW AND USED



Sound Equipment, Moving Picture Machines, Screens, Booths, Opera Chairs, Spotlights, Stereopticons, Film Cabinets, Portable Projectors, M. P. Cameras, Generator Sets, Reflecting Arc Lamps, Carbons, Tickets, Mazda Lamps and Supplies.

Projection Machines repaired and overhauled. Repair parts for all makes opera chairs. Attractive 3x10 ft. muslin banners, \$1.50; on paper, 50 cents.

**We Pay Highest Prices for Used Projection Machines, Opera Chairs, etc.**

Everything for the Theatre—Write for Catalog K.

**MOVIE SUPPLY CO., 344 So. Wabash, Chicago**



# When *Trouble* Comes Alibis Don't Go . . . . .

There's a whale of a difference between a promise and a performance. You can't fix up a balky projector and get the show going with promises, and alibis don't "click" when trouble besets you. National Service is a source you can rely on implicitly for prompt performance when things go hay-wire mechanically. Day or night, in every National Branch throughout the nation, there's someone always ready to bring relief when help is needed. A "loaner" mechanism to get things going—a Genuine Part to make a quick repair. Whatever you need in a hurry, you get in a hurry when you call your National Branch. Then, too, there is an always reliable repair service, in charge of mechanics who know how to do a satisfactory job of repairing, with *genuine parts*, at reasonable cost. In more ways than one, National is a friend to the Projectionist.

**NATIONAL THEATRE  
SUPPLY COMPANY**  
*Branches in all Principal Cities*





GOOD SOUND AND VISUAL PROJECTION  
CANNOT BE SECURED WITH WORN OUT AND  
OBSOLETE PROJECTION EQUIPMENT

*Better Projection Pays*  
REPAIR with GENUINE *Simplex* PARTS  
REPLACE with *Simplex* PROJECTORS

## THE LITTLE FELLOW

by W. L. Ainsworth

Reprinted from July 18, 1931, issue of Motion Picture Herald

*This article of timely and interesting import concerning the theatres of the lesser cities and towns comes from the pen of an exhibitor markedly well fitted by the nature and duration of his experience to make such expression. Mr. Ainsworth operates the Garrick theatre of Fond du Lac, Wisconsin. The article is taken from the annual issued in connection with the twentieth convention of the Motion Picture Theatre Owners*

*of Wisconsin held in June in Milwaukee. His argument for recognition of the institutional importance of the theatre in the small community, as an integral part of the community, cannot be set forth too often. A special interest attaches, too, to his citation of some of the exploitation advantages which the exhibitor in the lesser towns may utilize and enjoy to his own profit and that of his community.—THE EDITOR.*

THE small-town theatre holds a prominent place in the motion picture industry. It commands the sincerest respect of those who make pictures and those who sell them. For, in the final check-up, it is small-town theatres that create the greatest part of the revenue for producers and the exchanges. It is a necessity in every community. It is the center of social and business life of the community. Through it, people in the small town get a visual contact with the outside world. Music, travel talks, noted plays and famous stars come to the small town through the medium of the talking picture screen.

Merchants of the small town realize the necessity of the theatre. It holds the public of the community and brings in those from nearby rural districts. For that reason, merchants are willing to co-operate with the theatre manager in advertising tie-ups that will be of mutual benefit.

In the majority of cases, the manager of the theatre is a native of his home town. He is usually active in civic movements. These things help to create good will and draw the attention of home people and those in the surrounding communities to his theatre and to attractions.

There is a belief that the key city theatre is drawing patrons away from the surrounding small-town theatre. This is true in some cases, but not where the exhibitor is "up and doing." The wide-awake small-town exhibitor realizes he is in a position to select his pictures from the entire market, because of little or no opposition in his town, while the key-city theatre, which is one of a number of theatres in its city, is obliged to take the entire output of a number of companies to assure it of a sufficient amount of product.

The small-town exhibitor can see releases in the key cities and select just what he wishes to show his patrons. He can also get the benefit of the advertising, of those pictures he chooses, from the big city papers and by playing these pictures soon after the key city showing has been made. Likewise he is in a position, because of his low operating cost in comparison to the theatres in the larger cities, to show these same pictures at a lower admission.

It is true that many people prefer, at times, to drive to other cities for a show, but if the local man is up-to-date in his pictures and right in his prices, he is in a position to receive the same kind of business from other nearby towns. If his prices are lower than those of the larger town, chances are more than even that he will retain the majority of his home-town business.

Truly the small-town theatre has its place in the sun, but the manager must take advantage of opportunity offered him. He must take pride in his theatre; keep it modernized, clean and up-to-date. He must be very critical in the selection of his pictures and, above all, must use every effort to give the public good sound reproduction—

for, after all, a great many theatres today are going begging because of poor sound.

INTERNATIONAL PROJECTOR CORPORATION  
92 GOLD STREET GENUINE SIMPLEX PARTS GIVE MOST SATISFACTORY RESULTS NEW YORK



# MOTION PICTURE PROJECTIONIST

*(Fourth Year of Publication)*

## THE ILEX F:2.5

STANDARD ADJUSTABLE  
PROJECTION LENS

### SHORT FOCAL LENGTHS

A new era in screen presentation brings forth larger pictures and wider screens. "Grandeur" effects from 35mm. film are now possible for every theatre with ILEX, offering the finest short focal length lenses that the present day market affords. This is true because ILEX lenses are corrected for critical definition, maximum sharpness, brilliant illumination and flatness of field. Slop-over and incomplete covering of the screen are cared for by the exclusive ILEX adjustable feature.

For the projection equipment you use, ILEX lenses are the best . . . perfect in performance . . . faithful in service. We can furnish engineering data and interesting literature to cover your projection problems.

ILEX OPTICAL CO. ROCHESTER, N. Y.



FURNISHED IN A WIDE RANGE  
OF FOCAL LENGTHS  
2½" to 9"



OPTICAL PRODUCTS OF PRECISION

# ILEX OPTICAL CO.

INSIST UPON ILEX — THE LENS THAT PUTS PERFECTION IN PROJECTION

A Mancall  
Publication

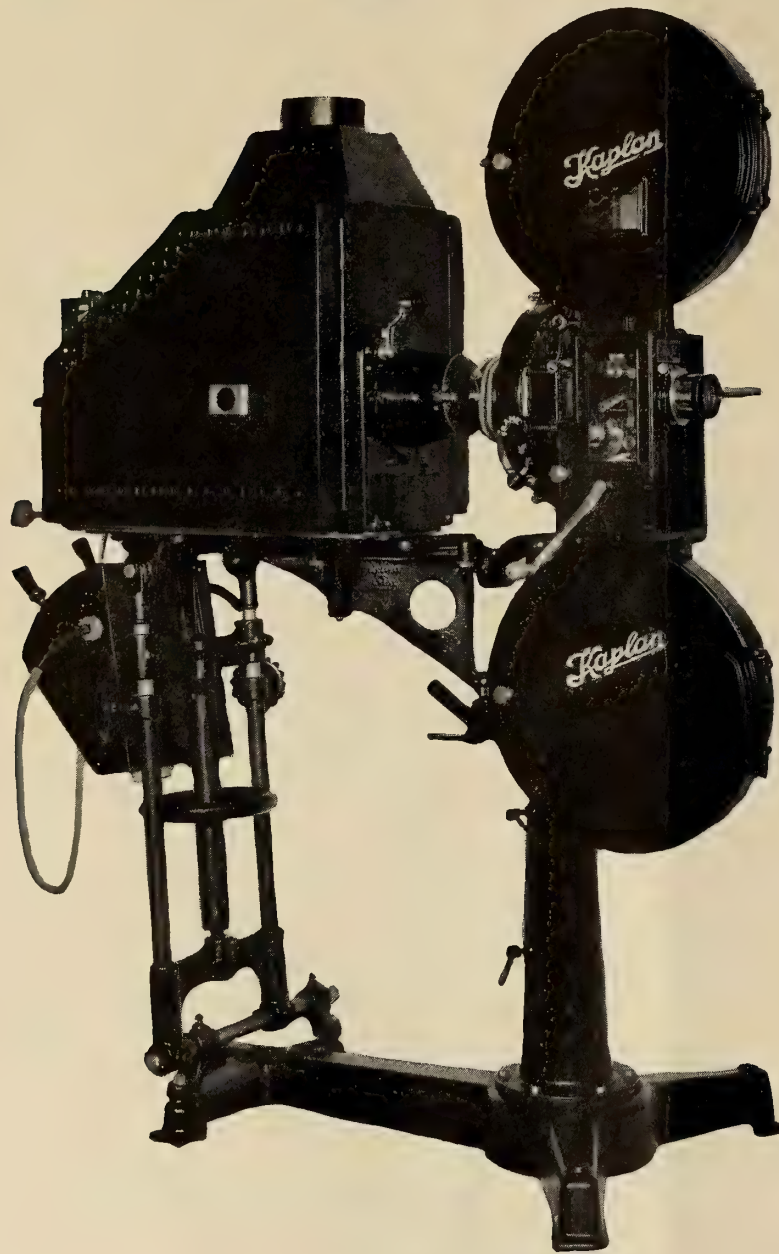
OCTOBER, 1931

Vol. 4, No. 12  
25c. per copy  
\$2.00 per year



# Kaplan

## PROJECTOR



The Kaplan projector has been standard equipment in many of the country's leading theatres for many years. Time has proven it to be a mechanism based on the soundest of engineering principles, both in design and construction.

Rigid — where rigidity is essential; no vibration; easy, smooth-running, noiseless, and long-enduring, it stands as a monument to the best and most modern factory methods and engineering work. Performance over a

long period of time is the acid test of all good product. Time and performance have been the best salesmen for the Kaplan Projector.

*An Engineering Product*

**SAM KAPLAN MANUFACTURING and SUPPLY COMPANY, Inc.**

729 Seventh Avenue

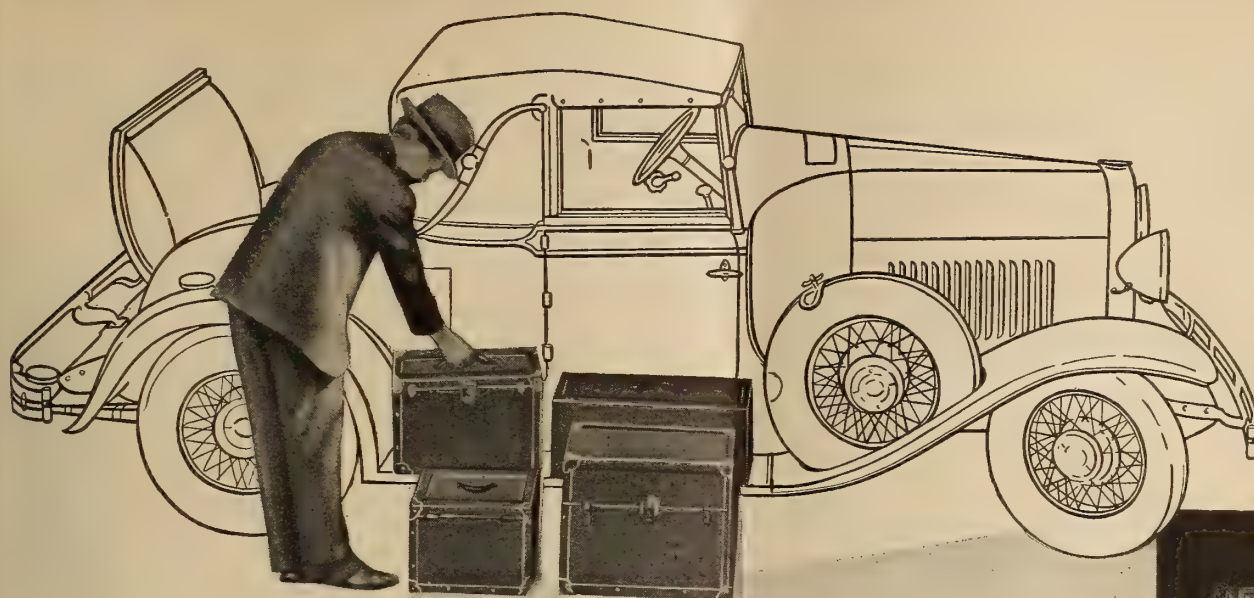
--

--

New York City



NOW YOU CAN PRESENT TALKING PICTURES ANY PLACE . . ANY TIME  
WITH RCA PHOTOPHONE PORTABLE SOUND REPRODUCING EQUIPMENT



## "THE THEATRE IN A SUITCASE" EASILY CARRIED IN A SMALL CAR

This new portable apparatus provides the perfect equipment for Road Shows, Small Theatres and Auditoriums where permanent installation is not desired as well as for private performances in Hotels, Homes, Clubs, Schools, Churches and Industrial Exhibitions.

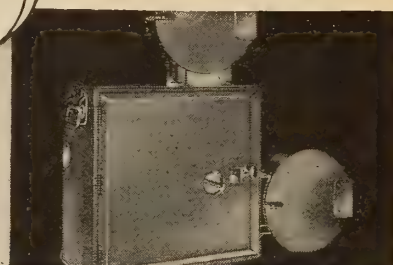
"The Theatre in a Suitcase" requires but 15 minutes to install and project... accommodates standard size film... complete with projector, amplifier, loud speaker, cables, connections, tubes and carrying cases—weighs less than 200 pounds... Power obtained from an A-C light socket. The smallest, lightest and simplest operated Portable Sound Reproducing Equipment embodies all superior qualities, acoustical principles, unmatched tone values that identifies RCA PHOTOPHONE performance in more than 3,000 leading theatres.

### LOWEST PRICE FOR STANDARD EQUIPMENT

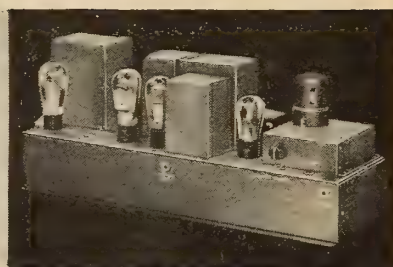
Now available through authorized dealers **\$1075.00**  
and company representatives . . Price

Write for booklet "The Theatre in a Suitcase"

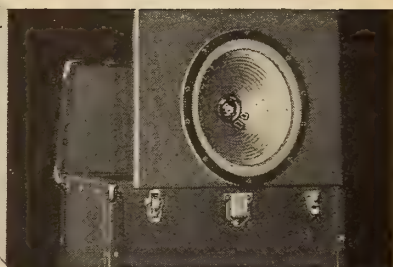
RCA PHOTOPHONE, INC. (Radio Corporation of America Subsidiary) 411 FIFTH AVENUE, NEW YORK



PROJECTOR



AMPLIFIER



LOUDSPEAKER





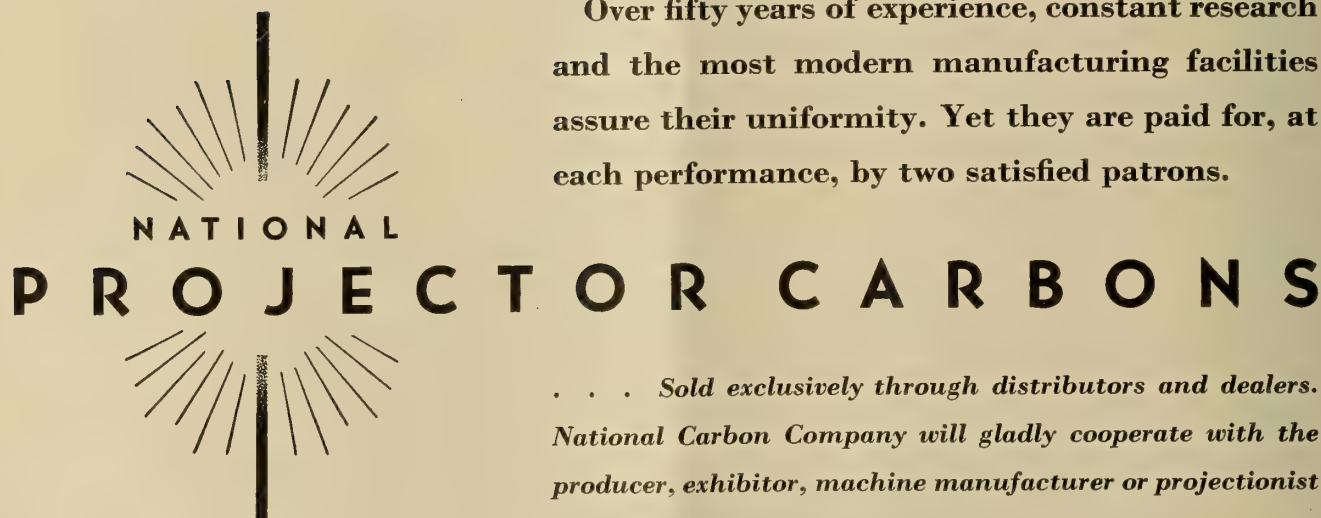
# Sixteen Million to One . . .

**M**OTION picture projection today demands a source of light sixteen million times as brilliant as the screen.

Due to losses through aperture, shutter, film, optical system and screen absorption, only a small percentage of the light from the source is reflected from the screen. This is spread over a picture a half million times the area of the crater from which it comes. That is why the crater brilliancy must be sixteen million times the brilliancy of the screen.

National Projector Carbons hold their leadership in the motion picture theatre because they provide a source of steady, white light surpassing the sun in intrinsic brilliancy.

Over fifty years of experience, constant research and the most modern manufacturing facilities assure their uniformity. Yet they are paid for, at each performance, by two satisfied patrons.



. . . Sold exclusively through distributors and dealers. National Carbon Company will gladly cooperate with the producer, exhibitor, machine manufacturer or projectionist on any problem involving light.

**NATIONAL CARBON COMPANY, INC.**

Carbon Sales Division      Cleveland, Ohio

Unit of Union Carbide  and Carbon Corporation

Branch Sales Offices:    New York    Pittsburgh    Chicago    San Francisco



# WHAT IS THIS MYSTERY, CALLED A PERFECT PICTURE?

## EVERYONE KNOWS THE ADVANTAGES

of "Balance" versus  
"Distortion" in Radio  
...

of "Correct Focus"  
on the Screen ...

of a scientific make-up with  
the Movie Artist ...

... ALL THESE DEPEND  
UPON PROPER ME-  
CHANICS

## "ACCURATE CURRENT CONTROL"

Likewise, is a simple  
matter, mechanically,  
when you have a

## TRANSVERTER

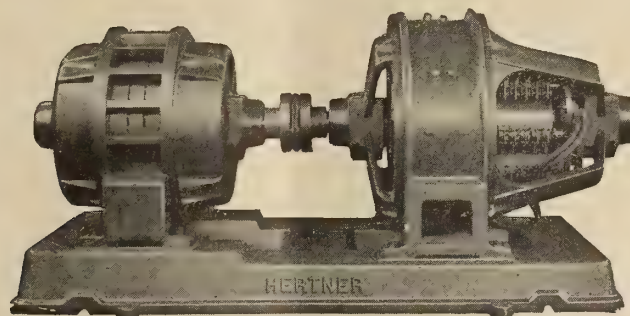
The Transverter gives your patrons something to talk about . . . gives them a REASON to boost your house.

Theatre goers not only tell their friends of a good production, well shown, and revisit your theatre . . . but they also ask WHY you have the edge on the "fellow across the way."

The answer . . . uniform projection . . . constant voltage . . . elimination of screen flicker . . . permits the patron to enjoy the relaxation that a good "feature" affords.

Install the Transverter behind the scenes and let your "features" come out of the port holes to entertain your patrons . . . not to annoy them.

Hertner Engineers are always ready to fill your requirements with the type and size of Transverter that exactly meets your needs.



TYPE CP TRANSVERTER

*Manufactured Exclusively by*

# THE HERTNER ELECTRIC COMPANY

12688 ELMWOOD AVENUE

**TransVerter**

CLEVELAND, OHIO, U. S. A.



A BETTER SHOW  
AND A SAFER  
ONE WITH

THE—  
**WHITE**  
SAFETY CONTROL  
WITH AUTOMATIC CHANGEOVER

A PRECISION  
MADE BOOTH AC-  
CESSORY THAT IS  
AS NECESSARY IN  
PROPER PROJEC-  
TION AS A HIGH  
INTENSITY LAMP.

A DISTINCT AID  
TO EVERY PRO-  
JECTIONIST BE-  
CAUSE IT HELPS  
HIM IN DOING A  
BETTER JOB.

*Safety*  
By

SOLD OUTRIGHT



*Made and Guaranteed by*

**WHITE**  
**ENGINEERING CORP.**

PARAMOUNT BUILDING  
NEW YORK

32ND & ARCH STREETS  
PHILADELPHIA, PA.

### Muscle Shoals Resolution Passed by Labor Council

The Tri-Cities Central Labor Council of Muscle Shoals, Alabama, has passed the following resolution respecting the disposition of the United States Government properties at Muscle Shoals:

"Whereas, a hundred and fifty million dollars of the taxpayers' money has been invested by the United States Government in the Wilson Dam and nitrate plants and properties at Muscle Shoals, Alabama, and;

"Whereas, the nitrate plants have for twelve years stood idle and the Government has lost approximately four million dollars a year by its failure to dispose of the power generated at Muscle Shoals, and;

"Whereas, it was the intent and purpose of the original legislation providing for this expenditure of the public funds that these properties should be devoted to the manufacture of nitrogen for explosives in time of war and fertilizer in time of peace, and;

"Whereas, after all these years of discussion the Government has failed to enact final legislation with reference to these properties, and said failure has resulted in a loss to the taxpayers of this country of many millions of dollars each year;

"Now, therefore, Be it Resolved, by the Tri-Cities Labor Council in regular meeting assembled at Sheffield, Ala., that the President and Congress of the United States be called upon and urged at the next session of Congress to enact final legislation for the disposition of the said Muscle Shoals properties in accordance with the said intent and purpose of the original legislation with reference thereto, and that, in the disposition of said properties they be devoted primarily to the manufacture of fertilizer in completed form to be sold to the farmers of the nation and thereby result in some relief to distressed agriculture, and if any surplus power there be, in excess of what is necessary for the full and complete operation of the nitrate plants, and kindred industries, the Government shall in the sale of said surplus power give preferential rates to states, counties, and municipalities.

"Be It Further Resolved, that copies of this resolution be sent to the President of the United States and to each member of the Congress and Senate of the United States. Also to President Green and Secretary Morrison of the American Federation of Labor and to each president and secretary of all international unions."

"We urgently request that all of organized Labor use their best efforts in procuring the above legislation. We feel that disposition of this property will help to relieve the unemployment in our nation, also increase the membership of Organized Labor."



# THE ERPI SERVICE ENGINEER



*Diagram of a Western Electric  
Sound System Circuit*

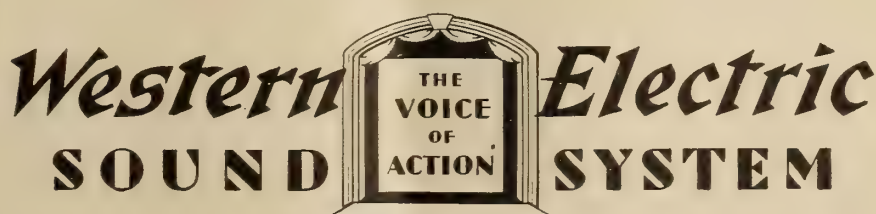
***knows his way through this intricate circuit  
... that's why he is able to protect you  
against Poor Sound, Breakdowns, Pro-  
gram Interruptions and Lost Patronage!***

Trained to Bell System standards of maintenance, the ERPI man can render this service more economically and efficiently than anyone else.

Backed by 50 years of voice transmission experience, the Western Electric Sound System is the finest equipment you can buy. Yet even

the finest equipment needs regular, painstaking and expert inspection and service.

By keeping your Western Electric Sound System operating at peak performance for the life of your contract, the ERPI Service Engineer helps you earn dividends on your investment!



Northern Electric in Canada

Distributed by

***Electrical Research Products Inc.***

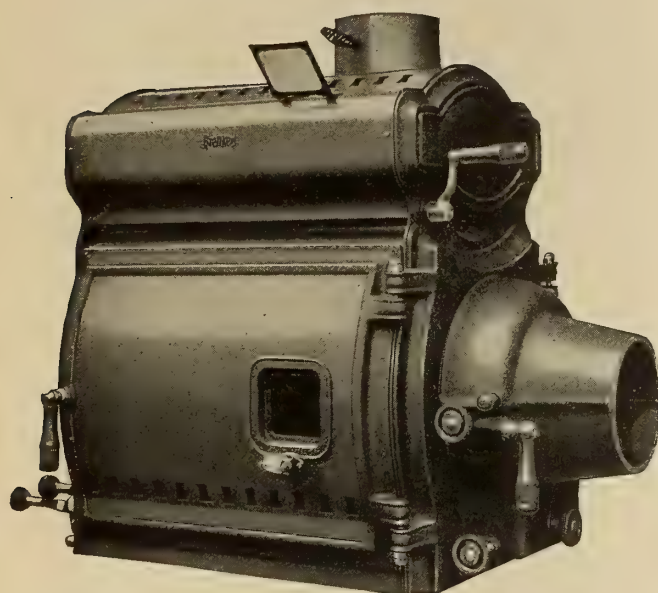
250 West 57th Street, New York



# Preference

by

## THOSE WHO KNOW!



# Brenkert

## SUPER HIGH INTENSITY PROJECTION LAMP

Preferred by operators and managers because it is precisely constructed to give lasting, trouble-free service, to produce maximum light, whiter light, to operate with greater convenience and low maintenance expense.

*Distributed by Independent Theatre Supply Dealers*

Ask  
Any  
User



Write  
for  
Literature

CORRECT DESIGN—PRECISION CONSTRUCTION

### BRENKERT LIGHT PROJECTION CO.

Engineers & Manufacturers

ST. AUBIN AT EAST GRAND BLVD., DETROIT

### Features of the Coming S.M.P.E. Convention

**A**N extensive symposium on the problems of 16 mm. sound films will be one of the features of the Fall Meeting of the Society of Motion Picture Engineers to be held at the New Ocean House, Swampscott, Mass., October 5-8.

Some of the papers to be given in this symposium which will be held on Monday afternoon of the meeting are:—"Description of the Educational Film Experiment in Washington," by Glenn Griswold of the Fox Film Corporation; "Advantages of 16 mm. Continuous Projectors," by J. L. Spence and J. F. Leventhal of the Akeley Camera Company; "16 mm. Optical Systems," by Allan Cook of Bausch & Lomb; "Advantages of 16 mm. Super Panchromatic Film for Educational and Medical Films," by Schwartz of the University of Rochester and Tuttle of Eastman Kodak; "16 mm. Sound on Film Dimensions," by R. T. May of R. C. A. Victor.

Many other papers dealing with many phases of the industry will be read during the convention. On Tuesday morning, Dr. H. E. Ives of Bell Telephone Laboratories will read the paper, "The Projection of Motion Pictures in Relief." H. E. Edgerton of the Massachusetts Institute of Technology will deliver a paper on "The High Speed Stroboscope." An open forum will be held among leading engineers on the subject of "Service to Producers."

On Tuesday afternoon three papers will be delivered on photographic subjects by experts of the Bureau of Standards.

Wednesday morning H. A. Frederick of Bell Telephone Laboratories will read a paper on "Vertical Cut Wax Recording." Another paper will be delivered regarding the new Bell & Howell Printer.

Thursday morning a paper will be given which describes in detail all of the many unique installations in the new Los Angeles Theatre, including a description of the vacuum tube light control and public address systems. Other papers to be read include "Theatre Design and Acoustic Treatment" by Ben Schlanger and V. A. Schlenker; "Resume of International Photographic Congress at Dresden," by Dr. S. E. Sheppard; and a paper by N. D. Golden of the Motion Picture Division of the Department of Commerce.

Nominations for all offices in the Society of Motion Picture Engineers have been made and acceptances have been received from the nominees. Ballots have been mailed to all active members of the Society and results of the election, now being held by mail, will be announced at the Fall Meeting.

Dr. A. N. Goldsmith, Vice-President and Chief Engineer of the Radio Corporation of America, and Dr. V. B. Sease, Director of Research, Dupont-Pathe Film Manufacturing Company have accepted their nominations for president. E. I. Sponable, Director of Research and Development, Fox Film Corporation, and M. W. Palmer, Electrical Engineer, Paramount Publix Corporation, are the nominees for vice-president.

Other nominees are as follows: J. H. Kurlander, Commercial Engineer, Westinghouse Lamp Co., and R. E. Farnham, Commercial Engineer, General Electric Co., for secretary; H. T. Cowling, Eastman Kodak Company, and W. B. Little, Engineer in Charge of Photometry, Electrical Testing Laboratories, for treasurer; L. C. Porter, Illuminating Engineer, General Electric Company; W. H. Carson, Vice-President, Agfa Ansco Corporation; W. B. Rayton, Director of Scientific Bureau, Bausch & Lomb Optical Company, and O. M. Glunt, Assistant Director of Apparatus Development, Bell Telephone Laboratories, for members of the board of governors.

J. I. Crabtree, who retires as president after holding this office for two years, has declined a renomination.



# MOTION PICTURE PROJECTIONIST

October, 1931

Vol. 4, No. 12

CHARLES E. BROWNELL, Editor  
Lester Isaac, *Efficiency*; J. H. Kurlander, *Light*; Thad Barrows, *Conservation*; J. E. Robin, *Equipment*; W. W. Jones, *Theory*; R. H. McCullough, *Sound Projection*; Harry Rubin, *Improvement*; Victor Welman, *Personnel*; Sidney Burton, *Production*

Published monthly by Mancall Publishing Corp., 7 West 44th St., New York City. Subscription rates in U. S.; twenty-five cents per copy; two dollars per year; three dollars for two years. Add fifty cents for Canadian, one dollar for foreign postage. Changes of address should be submitted three weeks in advance of publication date to insure receipt of current issue.

Entered as second class matter Oct. 25, 1927, at Post Office, New York, N. Y., under the act of March 3, 1879. Additional entry at New Brunswick, New Jersey.

## Canadian Representative

H. N. Elliott, 203 Vaughan Road  
Toronto, Canada.

## Australian Representative

McGill's Agency  
179 and 218 Elizabeth St.  
Melbourne, Australia.

## Advertising Manager

Mortimer Glancoff

## Editorial & Advertising Office

7 West 44th St.  
New York City.



## New Boston School Opens

Radio Training Schools, Boston, Mass., was officially opened on September 21st. Its President, Rudolph L. Duncan, is well known in the radio educational field. He is a member of the Institute of Radio Engineers, American Institute of Electrical Engineers, American Academy of Air Law's Committee of Government Regulation and Control, Radio Club of America, Veteran Wireless Operators Association and a Major in the U. S. Army Reserve Signal Corps.

Radio Training Schools, located at 799 Boylston Street, Boston, is offering resident courses in radio service, advanced technology, radio operation, broadcasting, television and sound, the last named being particularly applicable to motion picture work. Morning, afternoon and evening classes will be given in the school, which occupies the entire second floor of the building and contains the latest equipment for every branch of radio and television.

# LOOK FOR BETTER PICTURES

NOT since sound first burst upon the eager ear of the movie fan have there been changes and improvements so important to the industry as those wrought by Eastman's introduction of ultra-speed negative film. They begin on the lot, and they carry through to the screen. Because of them you can look for better pictures for your audiences. And that is an augury of *better business for you*. Eastman Kodak Company, Rochester, New York. (J. E. Brulattour, Inc., Distributors, New York, Chicago, Hollywood.)

EASTMAN *SUPER-SENSITIVE*  
Panchromatic Negative, *Type 2*

## F. S. C. OPTICAL CROWN PLATES

For enclosing Port-  
holes of Projection  
Booths

PRECISION SURFACES  
NO DISTORTION

## S. O. G. "IGNAL" CONDENSERS

Made of extra heat  
resisting Optical  
Glass

ALL SIZES  
ALL FOCAL LENGTHS

*Sole Distributors*

# FISH-SCHURMAN CORP.

45 West 45th Street

New York City, N. Y.



# THEY KEEP A-RUNNING



20/40 to 100/200 Ampere 2-Bearing Actodector

## Continuous Operation

Based on a complete knowledge of the particular requirements in projection booths, Roth Multiple Arc Type Actodectors are accurately built and liberally proportioned to insure continuous operation... They are especially suited to sound equipment installations... They supply steady direct current power to the arcs, which results in brilliant screen illumination of uniform intensity—even during change-over... Size range—20 to 600 amperes... Furnished in 2- and 4-bearing types, dynamically balanced.

### CENTURY-ROTH INVERTED ROTARY CONVERTERS

*deliver alternating current, from any direct current source, for operating Gaseous Tube Signs, Public Address Systems, etc.*

## ROTH BROTHERS AND COMPANY

*Division of Century Electric Company*

1400 W. Adams St.

Chicago, Ill.

*Distributors and Offices in all Principal Cities*

DIRECT CURRENT  
MOTORS AND  
GENERATORS



MOTOR GENERA-  
TOR SETS AND RO-  
TARY CONVERTORS



# As *The* EDITOR Sees IT

¶ *A Hardy Perennial*

THESE are certain questions in this industry of ours that are of such a vexing and controversial nature that their solution appears in the light of a practical impossibility. Of this kith and kin is the subject of service contracts and service charges for sound equipment installations—a matter of such a disputatious and argumentative character that probably the last word will not be heard concerning it until the wicked cease from troubling and the weary are at rest. As is the case with every subject of sufficient importance to merit serious discussion, there is much to be said in favor of either side of the question.

Certainly, the advent of sound has meant very little to the exhibitor in the way of additional box office returns. He has had to invest in equipment for its reproduction and contribute to the maintenance of that equipment, but it is very doubtful whether his gate receipts have shown any appreciable increase.

For this lamentable state of affairs, say his critics, he has only himself to blame. He is, maintain they, a victim of lost opportunities. He should have raised his price of admission. He should have done this. He ought to have done that. The probabilities are that the exhibitor was in a better position than his would-be critics to appreciate what increase if any his patrons were willing to pay and still maintain their customary frequency of attendance.

The one recognized and incontrovertible fact in the entire argument is that sound equipment must be serviced. Such equipment is a product of advanced engineering skill. It is complicated and even delicate in design and construction, and the type of service rendered must necessarily be of a highly specialized order. Insofar as expert technical service, preferably rendered by the engineering personnel of the sound companies themselves is concerned, no exhibitor in his sane mind can doubt its wisdom or fail to appreciate its advantages.

It is true that the projectionist is a highly trained technician. His sphere is the projection room, and his task in the main to operate the equipment. To expect him, in the midst of a multiplicity of duties, to service sound equipment and to solve those intricate problems which are often baffling enough to the sound engineer is not only inexpediency—it is folly. The projectionist has enough on his mind and a big enough task on

his hands not to be worried with the intimate engineering details of sound equipment. The question is, therefore, not whether the sound equipment service which is being rendered is necessary—but whether the charges imposed on the exhibitor for such service are equitable.

The fact that certain of the sound companies have recently made readjustments in their contracts and rates would at first glance appear to lend some countenance to the oft-repeated accusation that service charges have been or are exorbitant. That such charges have generally been high cannot be denied. That they have in some instances, perhaps, worked hardships, is plausible. But that they have been or are exorbitant, is open to dispute.

In justice to those companies that have brought about a readjustment in their rates, it may be said that the exhibitor is probably profiting by the fact that with three years or more of experience the sound companies have achieved a better organized and more efficient service system. The placing of service units at strategic points, and the routing of service engineers in the cheapest, quickest and most effective manner are problems which have been met and for the most part overcome in the few years that are past.

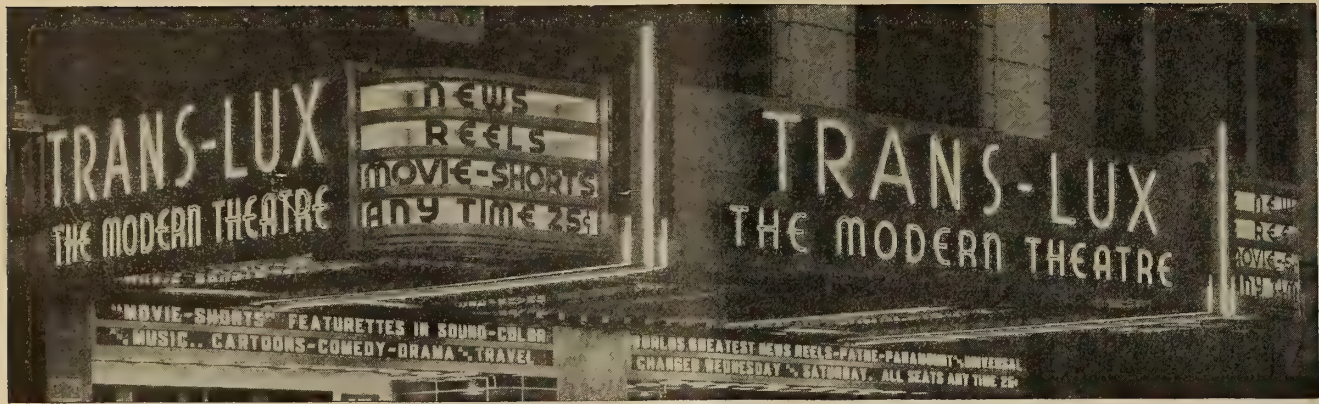
An interesting aspect of the argument is that those exhibitors whose houses are situated in small country towns and remote areas, and who do most of the complaining, in reality profit most by the present system.

The truth of this statement is easily demonstrated. At the present time, the exhibitor whose theatre is located in a thickly populated district, convenient to and often in the same city as the district service office, pays the same service charge for a given size equipment as the exhibitor whose house is located at a point remote from the service station. Yet the latter man's equipment receives the same expert and adequate service as the former's—a service sometimes rendered at an expense many times in excess of the charge in question.

As was said at the outset, the problem is interesting, many-sided and highly controversial, and its solution appears very far off, but in the foregoing words an attempt has been made to present certain of its aspects which are prone to be overlooked in the heat and turmoil of a partisan discussion.

CHARLES E. BROWNELL





## Trans Lux Rear Stage Projection

By WILLIAM MAYER

Chief Projectionist, Trans Lux Movies Corporation

In the following article Mr. Mayer presents the first authorized and authentic story of the Trans Lux system of rear stage projection. A member of Local 306 and at present Chief Projectionist of the Trans Lux Circuit, Mr. Mayer has been associated with the motion picture industry for many years. "As a projectionist with the Western Electric Company and later with the Fox-Case Corporation, his experience in the field of sound projection may be said to extend to the early beginning of that industry. THE MOTION PICTURE PROJECTIONIST is deeply indebted to Mr. Mayer for the interesting and able manner in which he has presented the story, and also to Mr. Courtland Smith, President of the Trans Lux Movies Corporation, for his kind assistance and permission to publish the article.—THE EDITOR.

**A**LTHOUGH for all practical purposes unused in this country, rear stage projection of a sort has not been unknown to the motion picture industry at large. Theatres constructed and equipped for picture projection from the rear of the stage have become increasingly popular in the British Isles and in Continental Europe in the past two decades. Houses of this type employed for the most part a ground glass screen or curtain upon which the picture was projected. Inefficient as this kind of screen must necessarily be, it was until recently the only medium reasonably satisfactory for the purpose.

The locating of the projectors behind the picture screen carried with it certain obvious difficulties. The distance from the projection lens to the screen was essentially large, requiring considerable depth back stage, with a consequent increase in the cost of theatre construction. The use of a wide angle projection lens and short throw resulted in the appearance of a "hot spot" or round area of white

light in the center of the picture screen. This, of course, was extremely objectionable.

### Reversal of Film Necessary

In addition, the film had to be reversed when threading the projector, a problem fraught with considerable difficulty, in that with the advent of sound on film, the reversal placed the sound track on the side of the film opposite to that which it normally occupies. This necessitated a rebuilding of sound head equipment destined for theatres using the back stage system of projection.

As a point of historical interest, it may be observed here that this problem had not to any extent been anticipated by the engineering and export departments of the American sound equipment manufacturers and much valuable time and money were expended in the rebuilding process. There are, in fact, instances where it was found well-nigh impossible to meet the requirements of back stage projection with sound on film reproduction without a complete redesigning of the equipment. For example, relocation of the exciter lamp house was obstructed by a mounting bracket—the internal construction of the sound head prevented the realignment of the sound head optical system—or the contents of the photocell housing were so disposed as to render their repositioning extremely difficult and extremely costly.

The first and perhaps the only recorded instance of back stage projection in the United States until the advent of Trans Lux as a commercial practicability, took place at Madison Square Garden in 1925, when a series of motion pictures depicting incidents of the Great War were shown in connection with an exhibition held under the auspices of the French Government.

The development of the Trans Lux system extends over a period covering

the past ten years and saw its inception in the organization of the Trans Lux Daylight Picture Screen Corporation, which was formed for the manufacture of small daylight screens for use in stock exchanges and brokerage houses.

This type of screen is unique of its kind. It is manufactured solely by the Trans Lux Daylight Picture Screen Corporation, which controls the patents and secret processes used in its manufacture. It has been developed expressly for rear stage projection, and because of its light refracting and dispersing qualities and its accurately calculated translucence, it is the only screen on the market today which is perfectly adapted for back stage projection.

### Years of Research

In the early stages of its development, it was found extremely difficult to construct screens of this type with sufficient area to be of practical commercial use in theatre projection, but with close application to the problems involved and years of careful research, the engineers of the Trans Lux Corporation have arrived at the perfect screen as it is known to the industry and to the theatre-going public of today. The first demonstration of the Trans Lux system as a commercial practicability for theatre use took place in July, 1930, at which time pictures were shown by means of a daylight screen and rear stage projection at the Assembly Theatre, Thirty-Ninth Street and Sixth Avenue, New York City.

Shortly afterward, the Trans Lux Movies Corporation was formed by Mr. Courtland Smith, and further research and development were carried on by the engineers of the new company.

Not only on its screen, but also on its system of rear stage projection, is founded the claim that the Trans Lux

Note: The accompanying illustrations were not furnished by the author.



system is the ultra-modern in picture projection and theatre construction. The limited space back stage, which carries with it the obvious connotation of an extremely short throw, has been a vexing riddle to the motion picture industry. Speculation has run riot but the silence of the Trans Lux Movies Corporation has been the silence of the Sphinx. The system, however, is an extremely simple and logical one. It will be briefly described in the following paragraphs:

The projectors are located directly behind the picture screen, and not at a point off-stage as some speculatively minded individuals will have it. The distance from the projection lens to the back of the screen is eight feet. This amazingly short throw is made possible by means of a special lens system. The projectors and sound heads are threaded in the standard way, no reversal of the film being necessary. Reversal of the image on the picture screen is accomplished by means of a reflecting surface which forms a part of the lens system.

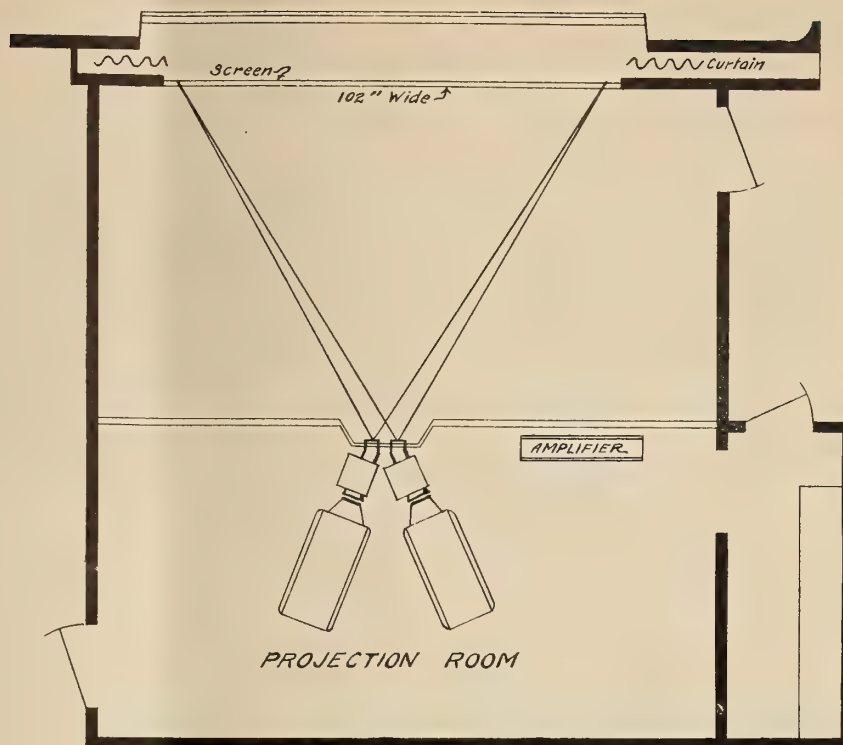
With respect to the position of the projectors, it may be said that they are set in such a manner as to form a forty-five degree angle, the forward end of the projectors forming the apex of the angle. This arrangement affords ample room for threading and ready access to all parts of either projector just as in ordinary projection practice. In the present theatres operated by the Corporation, Kaplan projectors are used.

#### Ample Operating Space

The distance from the screen to the back wall of the stage averages thirteen and one-half feet. The projection room is large in every instance, and there is no suggestion of cramping. RCA Photophone sound equipment is installed in all houses owned and operated by Trans Lux. The loudspeaker baffles are located below and very close to the bottom of the picture screen. This arrangement affords excellent illusion.

The operation of the equipment is simplicity itself. There is no difficulty in focussing, it being entirely practicable to conduct the procedure from the projection booth, although it is customary to have someone at the front of the screen as a double check on the crispness and clarity of the picture. An interesting observation which may be made at this point is the fact that from the projection room the picture titles appear reversed on the picture screen. This occasions no real difficulty, however, as it requires but an amazingly short time to become adept at reading the captions from right to left.

The advantages of rear stage projection as exemplified in the Trans Lux system are numerous and readily apparent even to the non-theatrical mind. It is for this reason among others that the public has manifested



Plan View Showing Projectors and Screen

such immediate and sustained interest. A few of the most salient and attractive features are that the Trans Lux system makes for cheaper and more compact theatre construction, that it materially lessens if not entirely eliminates the panic and fire hazard, that the audience is seated in a comfortably but not obtrusively lighted auditorium, an arrangement which permits the newcomer to locate his chair without difficulty, and last but not least, it eliminates certain moral risks not unknown to exist in darkened houses. This last statement, while it may sound prosy to the sophisticated, is demonstrated by the fact that parents have displayed no hesitancy in permitting their children to visit the well lighted Trans Lux houses.

At the present time the Trans Lux Movies Corporation owns and operates three theatres for the showing of news reels and short subjects. These houses are located in New York City. From every viewpoint the project has been highly successful. While the theatres are small, averaging some one hundred sixty seats per theatre, the overhead has been negligible and the turnover has been enormous. The show is of comparatively short duration, being devoted entirely to news reels and short subjects mainly of an educational character. The show is continuous, patrons may enter or leave at any time, the subjects being repeated some twenty times during the course of a day. As an example of the financial practicability of the project, the fact may be cited that one of the New York City houses has been averaging a daily

attendance of some three thousand persons.

Under the able leadership of Mr. Smith, plans are already under way for the erection of seven hundred Trans Lux theatres throughout the United States. One hundred and fifty of these, it is expected, will be located in New York City. Negotiations have already been completed for the installation of such theatres in the railroad terminals of New York and other large cities. This is only the beginning. It may be said in all confidence that Trans Lux is not only the theatre of the present, but the theatre of the years that are to be.

#### Italian Film Shortage

It is reported that a representative of the Pittaluga Company has just returned from the United States with only 20 films purchased from the 180 inspected. It is stated in connection herewith that the position of the Italian exhibitors is getting more and more difficult. Even Pittaluga, the leading chain which is therefore able to pick the best of available films, has had to close some 30 houses owing to film shortage.

Cines output for the next season is estimated at 24 features and about 100 sound shorts. Pittaluga houses, on the other hand, require about 250 films a year. European producers hope, therefore, to be able to increase their participation in the Italian market, possibly forgetting that their product meets in Italy with exactly the same difficulties as American firms have to face, that is to say the prohibition of foreign dialogue.



# Stereoscopic Motion Pictures

By LLOYD E. HARDING

*During the late war, Mr. Harding served on the Western Front with the U. S. Army air force, being principally engaged in making photographic surveys from the air of the enemy territory. He was at one time staff photographer with the Chicago Evening Post, and photographed some of the first air meets held in that city. Mr. Harding is now chief instructor in one of the largest and best equipped sound motion picture schools in the East. In the following article he presents some interesting data on the history and development of stereoscopic pictures.—THE EDITOR.*



Fig. 1. A Stereoscopic Pair

**T**HE belief has often been expressed that the one thing needed to bring the motion picture to the place where it could successfully rival the legitimate stage in naturalness of presentation is the introduction of "stereoscopic" effect to the screen presentation. This formidable word "stereoscopic" means nothing more than the projection of a screen image that gives a real effect of a third dimension or we might say "thickness" to the brain of the observer.

When we say that the effect is given to the brain of the observer, it must be remembered that practically every one of our five senses, sight, feeling, hearing, smelling, and tasting are but the result of certain impulses, which are sent to the brain by certain sets of nerves. These nerves all end in the brain and begin in the organ of the sense with which they are associated. That is, the nerves that send impulses of sight to the brain begin in the eye, those that transmit "taste" sense start in the mouth, those of hearing, in the inner ear and so on.

## Sensation of "Seeing"

Another interesting feature of the sense channels is that the nerves which transmit each sense impulse are gathered together in a certain small section of the brain. So that if, for instance, the section of the brain allotted to nerves from the eyes is "touched" the sensation of "seeing" is experienced and if that particular section of the brain were destroyed, blindness would result even though the eyes and their nerve channels were undamaged. That seeing occurs when the "sight" section of the brain is stimulated, is proved by the fact that a blow on the head causes one to "see stars" even when the eyes are closed.

The illusion of motion pictures itself depends on a certain effect known as "persistence of vision." This enables the brain to "see" a great number of pictures succeeding each other in rapid succession as a single picture that "moves." This ability to "fool

the brain" is responsible for a great many of the inventions which are used today to amuse, entertain and instruct millions of people through the use of devices which are more or less familiar to all of us.

The motion picture as we know it at present is merely a two-dimensional surface filled with moving shadows, and no matter how "solid" the objects or people may seem, the fact remains that they are still "just shadows" on a flat surface. By "two-dimensional" is meant that the shadows have width and height but no "depth."

## Three Dimensional Vision

Now most all of the things we see in our daily life are three-dimensional, they are "wide," they are "high," and they are "thick" or "deep." So that we can say, for instance, that a block of wood is ten inches high, six inches wide and four inches thick, or that a house of a certain shape is 30 feet wide, 20 feet high and 40 feet long. These measurements imply that the object mentioned takes up a certain number of cubic feet of space whereas, in the case of an image on a motion picture screen it can only be said that it takes up a certain number of square feet of space and therefore lacks one of the three dimensions.

In both the cases mentioned, that of the two dimensional object and that of the three dimensional object, the eyes in conjunction with the brain are able to see that one is "flat" while the other is solid.

In order to do this, however, it is necessary that the object be seen from two different angles or positions and it is for this reason that nature provides the vast majority of living creatures with two eyes instead of just one.

## Two Simple Demonstrations

If you will close one eye and look at an object you will find that it is exceedingly difficult to determine the depth or thickness of that object with any degree of accuracy. The fact

that you are able to do so at all is due to the "experience" you have had in seeing things with two eyes and that you remember that certain things, like man, for instance, are always of a certain approximate size. If, therefore, you see him with only one eye and he appears smaller than you know him to be, your experience tells you that he only seems to be smaller because he is further away from you.

Another way in which vision with one eye is able to tell whether one object is nearer to the observer than another object, is by noting that the nearer object obscures or cuts off part of the view of the further object. It is readily seen, however, that when it comes to judging size, shape or distance of an object two eyes are infinitely better than one.

The reason why two eyes are so much more efficient than one is that by the combined use of the two eyes we are able to see "around" small objects and to see two sides of larger objects. This ability to see around a small object can be easily demonstrated to your own satisfaction by holding a pencil up at arm's length before you and looking at some object beyond the pencil.

## What the Eyes See

You will find by closing one eye and viewing the object that a part of the object is obscured by the pencil but that when this eye is closed and the other one opened, the part of the object formerly concealed by the pencil will become visible while another part of the object now becomes hidden. This demonstrates that when both eyes are open and the object beyond the pencil is viewed there is no part of it hidden from sight when both eyes operate in unison.

It may be said, therefore, that what the eyes actually see is two slightly different scenes, the left eye seeing one scene while the right eye sees a slightly different scene due to its position being about  $2\frac{1}{2}$  to  $2\frac{3}{4}$  inches away from the left eye. Although each eye "sees" a slightly different



version of the same scene, it must be true that these two different pictures are merged or joined into an impression of a single picture by the brain, for we know that when we view any object or scene with both eyes open the result is that we are conscious of there being only a single scene before us and not two different scenes.

It stands to reason that if the single image which the brain "sees" is composed of two slightly different images, then the single image must partake of the combined characteristics of each picture or to put it another way, the "brain picture" is a "cross" between the two "eye pictures" much as we might expect that the mating of a white rooster with a black hen would produce gray, or half black and half white chicks.

If it is true that the merging of two separate "eye pictures" produces a modified "brain picture," then it must be equally true that no device which does not permit the left eye to see one picture and the right eye to see another picture can ever cause the brain to see a modified brain picture. And yet in countless cases patent applications have been filed which entirely ignore this fundamental fact and of course the methods themselves have failed to produce real stereoscopic or third dimension pictures.

It has been amply proved, however, that stereoscopic vision as regards the viewing of pictures is easily made possible if the fundamental principle of stereoscopic vision is adhered to.

#### The Stereoscopic Method

The stereoscope method of producing binocular vision of pictures is very old. Most of you are perhaps familiar with the stereoscopic viewer that used to lie on the table beside the family album in many homes of the past century. It consisted of two lenses mounted on a device which contained a sliding rack for holding the pictures to be viewed. A card with the two slightly different pictures was inserted in the sliding rack which held it in a vertical position. Figure 1 shows a typical view as seen on the card the two pictures being called a "stereoscopic pair."

Although each picture of the pair seems to be the same there is a slight difference due to the difference in position of the lens that took the left picture from that of the lens that took the right picture. In other words, the left hand lens took a picture showing more of the left side of the subject and the right hand lens picture shows more of the right side of the subject. This is exactly the effect the eyes produce in seeing a scene and it can be said that if the eyes occupied exactly the same position as the lens the same two pictures shown would have been seen by the eyes. By placing the viewer so that the eyes looked through the two lenses, a very pronounced stereoscopic effect was produced, the subjects ap-

pearing to stand out in bold relief as if the actual scene itself was before the eyes instead of just a picture of the scene.

In this case the principles of true stereoscopic vision were being faithfully followed, in that the vision of the left eye was confined to the viewing of one picture while that of the right eye was restricted to the viewing of another picture taken from a position about  $2\frac{3}{4}$  inches to the right of the position occupied by the camera when it took the "left picture." It was comparatively easy to confine the view of each eye to its respective picture in this type of stereoscope because it was only necessary to erect a barrier of wood or cardboard extending from a position between the two lenses to the dividing line between the two pictures. This absolutely prevented the left eye from seeing the "right" picture and vice versa.

The photographing of the scene from which the prints were made for viewing purposes was done with a camera equipped with two lenses placed about  $2\frac{3}{4}$  inches apart in a horizontal line so that the resulting negative consisted of two pictures located side by side, one of which had been taken by the left lens and the other by the right lens. From these negatives, positive prints were made and mounted on cards which were later inserted in the viewer.

#### Lantern Slide Experiments

With the coming of lantern slide projection the idea was advanced that if the two pictures were thrown to the screen side by side a large audience would be able to enjoy the effect of life-size pictures in relief or in three-dimensional form. As might be expected, when the two pictures were projected side by side on the screen and viewed with the unaided eyes, all that was seen was

two separate pictures, each eye seeing both pictures, and no stereoscopic effect was produced.

It was found, however, that by considerable concentration the eyes could be made to focus so that only the "left" picture was seen by the left eye and only the "right" picture by the right eye. When this result was achieved by the observer a pronounced stereoscopic effect became at once apparent. Not everyone, however, is capable of the concentration necessary to cause each eye to focus independently and for even those capable of it the strain is too great to allow of continued viewing by this method.

There then came a good deal of experimenting in an endeavor to devise a method whereby the vision of each eye might be restricted to a view of its respective picture only. It became obvious immediately that it would be entirely impracticable to use the method that proved feasible in the case of the hand stereoscope for even if a partition were built down the center of the room to the screen only a comparatively few people would be able to view the picture at one time.

#### Color Filter Used

Someone struck upon the idea of using the absorbing power of colored glass or gelatin to shut out the unwanted picture from each eye and to allow each eye to see the desired picture. They reasoned that if a red filter absorbed red light rays and allowed green light to pass and vice versa, this method might be used to confine the proper image to its respective eye, that is, a view of the left image to the left eye and of the right image to the right eye.

In order to work this system the left picture is thrown on the screen through a red colored glass which produces a red image on the screen. The right picture is projected to the

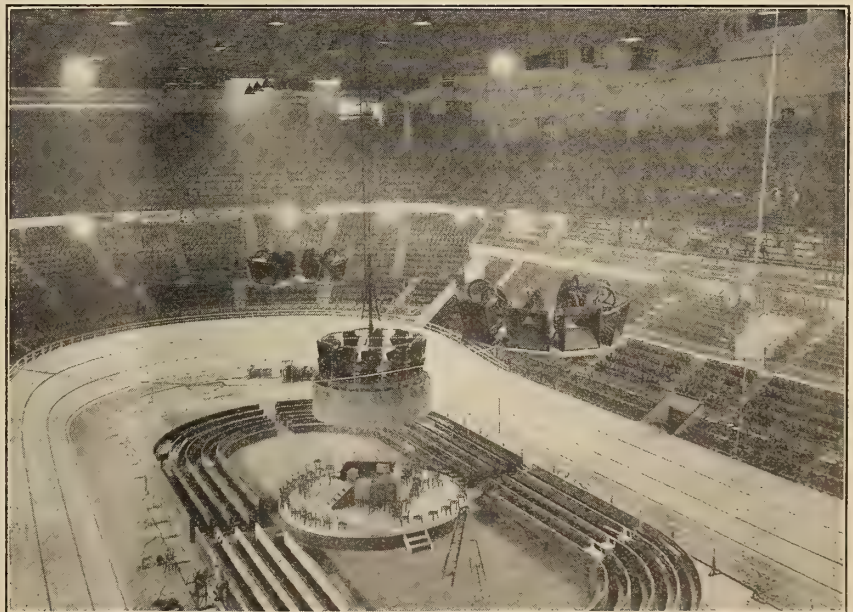


Fig. 2. Back Lighting Gives Effect of Depth



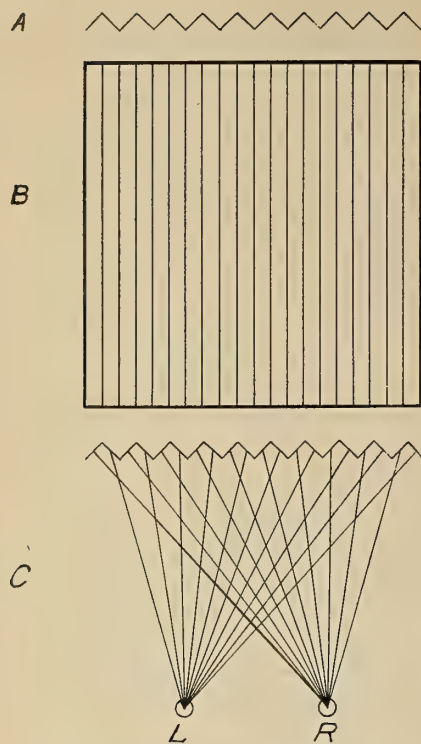


Fig. 3. Suggested Scheme for Stereoscopic Projection

screen through a green glass which results in a green image on the screen. Instead of having these red and green images side by side on the screen, however, they are super-imposed one upon the other so that the two colored images joining, produce the effect of one image of a gray or black and white appearance, similar to the projection of a single black and white picture to the screen.

If we now put on a pair of glasses which places a green glass over the left eye and a red glass over the right eye we find that the green glass absorbs the green light rays from the "right" picture, making it invisible to the left eye, but allows the red rays from the "left" picture to reach the eye which makes that picture visible. The red glass over the right eye produces the reverse effect by absorbing the red light rays of the "left" picture and making it invisible to the right eye while it passes the green rays from the "right" picture and makes that picture visible to the right eye only. This achieves the desired result as far as the conditions for producing stereoscopic effect are concerned, for we now have the left eye seeing only the left picture while the right eye sees only the right picture.

#### Adapted to Motion Pictures

This color filter method has been used successfully in motion picture projection, each person in the audience being supplied upon entrance to the theatre with cardboard and colored gelatin glasses which are held before the eyes and through which the picture is viewed. In this case,

however, it was not feasible to make the special cameras and projectors necessary to take two pictures side by side on a film and project images from such a wide film to the screen, so a different method of taking and projecting the pictures was arranged.

The camera was provided with a double lens and moving reflector system that took one frame or picture through one lens and the next frame through a lens located  $2\frac{3}{4}$  inches horizontally from the first lens. This procedure resulted in every alternate frame being taken through a "left" lens and the intermediate frames through a "right" lens. Each alternate picture was therefore slightly different from the picture of the adjacent frame inasmuch as one-half the frames were taken from a lens position  $2\frac{3}{4}$  inches distant from the lens position at which the other half of the frames were taken. This was equivalent to taking one picture of the "stereoscopic pair" of Figure 1 and placing it below the other instead of in its former position at the side of the first picture.

It must be remembered that this difference in succeeding pictures was in addition to that difference due to breaking the action of the picture up into 16 periods per second, which was the number of pictures per second taken when photographing silent picture features before the coming of sound pictures.

#### Color Disc Used

In the projection of these stereoscopic motion pictures the only necessary addition to the projector was a revolving color disc that caused each alternate frame to be projected through a green gelatin and the intermediate frames through a red gelatin. It is thus seen that all the frames taken through the left camera lens would be projected in red and all the frames taken through the right camera in green.

The colored glasses (green over the left eye and red over the right eye) worn by the audience allowed only the "left" or "red" projected frames to be seen by the left eye and only the "right" or "green" projected frames to be seen by the right eye.

The stereoscopic effect thus produced was most pronounced and effective and brought forth praise and applause from the audience. The showing of these pictures was soon discontinued, however, due to a number of reasons, none of which seemed to carry much weight in view of the widespread interest which the pictures aroused.

Another method made use of film with alternate "left" and "right" pictures as in the color filter method, but which were projected to the screen superimposed one upon the other without using color filters of any kind.

The observer was supplied with a

shutter arrangement that was held before the eyes in the manner of a lorgnette (eyeglasses which are held before the eyes by the use of a handle). Only one eye at a time was uncovered by the shutter which was mechanically connected to the projection machinery so that the left eye was uncovered and permitted to view the screen only while the "left" picture was being projected to the screen, the right eye being covered by a metal slide during this period. When the projector moved the next frame which contained a "right" picture, into the aperture, and projected its image to the screen the eye shutters operated to cut off the vision of the left eye and open up the vision of the right eye.

This device also produced good stereoscopic effect because the fundamental principles necessary to produce the illusion of third dimension or depth had been complied with, and the left eye saw only "left" pictures and the right eye only "right" pictures.

#### Stereoscopic Picture Claims

There have been a great many claims that certain pictures had "stereoscopic" vision when all that the producers had done to secure their so-called third dimension effect was to use "back-lighting" methods. It is well known that if a scene has a fair proportion of its illumination coming from the back part of the set during the filming of the picture instead of having it all come from the front or sides, a certain small effect of "depth" is produced.

The photograph of Figure 2 is a fair sample of how back-lighting produces a "relief" effect. It is a photograph of Madison Square Garden taken during process of "treating" the ceiling with acoustical absorption material. Due to the fact that most of the lighting falls on the seats and bicycle race track which are beyond or "back" of the three clusters of loudspeaker horns suspended from the ceiling, the horns themselves seem to "stand out" in bold relief when seen against the well lighted background. You will find the effect greatly enhanced when the horns are viewed through a magnifying glass, and if this picture were to be made up into a lantern slide and projected to a screen the third dimensional effect would be very pronounced.

Nevertheless, the difference between the "depth" effect of such a picture and the real stereoscopic quality of a picture produced and exhibited according to true stereoscopic principles is so great, that the claims of the former that it represents true stereoscopic quality fade into insignificance in comparison.

There are several other methods which have produced real stereoscopic motion pictures, notably that

(Continued on page 40)



# Coupling the Photocell to the Amplifier

By R. J. STIER

*Mr. Stier received his engineering training at the Armour Institute of Technology and at the University of Chicago. He was at one time an instructor at Radio Institutes and has seen service with both Electrical Research Products Inc. and RCA Photophone, being at the present time associated with this latter organization. Mr. Stier is eminently fitted by experience and background to discuss the subject upon which he has chosen to write.—THE EDITOR.*

**I**N 1857 a Frenchman named Leon Scott recorded sound for the first time in the occidental world. His device, which was called the Phonograph, was worthless from the standpoint of reproduction since the sound record consisted only of a wavy line traced upon a smoked paper. Edison is generally credited with recording the first reproducible sound. His invention, completed in 1877, utilized tinfoil in place of the smoked paper used by Scott and was the first application of what was later known as "hill and dale" disc recording. From that date until the presentation of the first film-recorded sound motion picture the history of the recording and reproducing of sound is one of constant endeavor and unceasing improvement, which we may profitably overlook at present. We are now interested mainly in the film sound records as they are made today.

Either of the two types of sound track used in commercial film recording today (a. variable area,—b. variable density) depend for reproduction upon one basic fact which is the variation in the amount of light falling upon the photocell. Whether the density of the sound track changes as the film moves, or whether the width of the record changes, the amount of light transmitted by the film varies in exact accordance with the originally recorded sound and produces correspondingly identical currents in the photocell receiving the light.

## Difficulties Involved

The construction of the modern sound attachment or sound "head" is such that the photocell, necessarily, is housed within the sound attachment and faces close to the film. Its necessary location presents a difficult problem in securing satisfactory coupling to the amplifier. This problem is aggravated by the fact that the power output of the photocell is of an extremely small order, being somewhere in the neighborhood of approximately 0.01 microwatts. While this power output will vary depending upon the "sensitivity" of the photocell used, the "intensity" of the light

source and the "modulation" of the film, is at best a minute quantity and must be handled with the utmost caution.

The earliest sound motion-picture reproducing equipment utilized photocells of the potassium type. Our present practice is to use a gas filled caesium cell which has greater sensitivity and power output than the older potassium type cell. Since the power output of the potassium type photocell is much less than that of the caesium cell, it requires an extremely short coupling line in order that the noises introduced to the reproducing system from extraneous "pick-up" are satisfactorily low.

## Background Noises

This question of pick-up of extraneous noises may be solved in either of two methods. Earlier systems solved the problem by "boosting" the level of the photocell output. This was accomplished by inserting a preliminary amplifier as close to the photocell as it was physically possible. Later systems, utilizing the more sensitive gas filled caesium photocell, used a transformer in the place of the amplifier. Careful design of the transformer permitted satisfactory coupling and eliminated all the inherent difficulties accompanying the use of the sound head amplifier.

Stray noises are picked up by what might be termed the "transformer action" of the line coupling the sound head to the main amplifying system. This transformer action may be explained, roughly, in the following fashion: from elementary electrical theory, we know that if any wire is moved in a magnetic field in such fashion that it cuts lines of force, there will be induced in that wire a voltage. The value of that voltage induced will depend upon the number of lines of force cut per unit of time; that is, the voltage induced will depend upon the strength of the field and the speed with which the wire is moved through the field. It is easy to see that the wire itself does not necessarily need to move, that if the magnetic field itself is moving, the lines of force will cut the wire just as effectively as though the wire itself were moved through a stationary magnetic field. This principle is true regardless of the "weakness" of the field; reducing the strength of the field merely reduces the total voltage induced.

Battery fed resistance load circuits in the steady state condition are, practically, the only circuits which surround themselves with a stationary magnetic field. Such a circuit

would be, for example, a small lamp fed from a storage battery. The lamp must be lighted to attain this condition. It cannot be in the process of *lighting* or *extinguishing*, for in that condition, the current is just *starting* to flow or is just *stopping* its flow and the magnetic field is respectively building up or collapsing; that is, the magnetic field is "moving" or "changing."

Such a moving or changing magnetic field surrounds practically every wire and piece of electrical apparatus used in the projection booth. While it is true that the strength of the field weakens rapidly as the distance from the current carrying wire increases; nevertheless, when using extremely low level circuits, voltages induced by such very weak changing fields can, and do, cause trouble. Wires from the sound head to the amplifier must pass through the rapidly changing stray magnetic field surrounding these wires, and since the stationary wires are being cut by a moving or changing magnetic field, there is being induced in these wires a small voltage. This voltage, which is applied to the grid of the first vacuum tube, is "repeated" through the amplifier and appears at the loud speaker in the form of "hum" or other undesirable noise.

While shielding will help reduce the value of this induced voltage, it is obvious that it will be impossible to eliminate it completely. It has been found that the background noise is not noticeable if it be kept a certain value or ratio below the sound level of the signal output. This ratio is not a fixed quantity but varies in accordance with the intensity of the reproduced sound in the auditorium and varies also with respect to the frequency of the reproduced signals. For all practical work, however, it is possible to determine, arbitrarily, a certain fixed maximum ratio, which may be expressed in terms of volts, above which value the noise is audible and objectionable.

## Method of Coupling

A theoretical study of the method of coupling the photocell to the amplifier has shown that the load impedance into which the cell should work should be made as large as possible. This is true for two primary reasons; first the voltage "swing" developed across the resistance, which is applied to the grid circuit of the amplifier following it, must be as large as possible, and, second the power efficiency of the photocell must be kept at as high a value as possible.

There are two limiting factors



which prevent the load impedance from being increased beyond a certain optimum value. First, there are small current leakages at all points of different potentials. These current leakages become increasingly important as the photocell load impedance increases, since the power so lost becomes a rapidly increasing percentage of the total power available for dissipation in the circuit. Second, the electrostatic capacitance present between parts of the circuit acts (especially as its value increases) as a shunt to the photocell load. Hence in designing photocell coupling circuits, it is of vital importance to keep the leakage resistance as high as possible in order to attain maximum power efficiency, and to keep the electrostatic capacitance to a minimum in order to secure satisfactory fidelity of the reproduced sound, most especially at the higher frequencies. There are, then, three primary reasons for using a sound head amplifier with the older potassium type photocell. These are:

1. To reduce background noise from pick-up.
2. To maintain a satisfactory frequency characteristic.
3. To yield a satisfactory workable photocell power output.

#### The Sound Head Amplifier

The sound head amplifier most commonly encountered today in projection rooms consists of either two or three stages of amplification. Power supplies for such amplifiers are usually derived from batteries or from carefully filtered motor generator set outputs. The photocell is usually resistance coupled to the sound head amplifier. In this fashion the load impedance, into which the photocell works, is kept at a suitably high value as the resistance of the coupling resistor is usually in the neighborhood of two megohms. Since the length of the connecting wire from the photocell to the sound head amplifier seldom exceeds nine inches, the leakage resistance is kept to a high value, while the electrostatic capacitance of the circuit is held to an almost irreducible minimum.

Transformer coupling is used between the stages of the two stage amplifier. The three stage amplifier is resistance coupled between the first and second stages and transformer coupled between the second and third stages. Output transformers for both types of amplifiers are wound to work into an ordinary two wire, low impedance line. For reasons of convenience, the fader is, normally, inserted in this transmission line. Thus the output of the photocell is taken before it has had a chance to have superimposed upon it any induced voltages from the transmission line and is amplified to a relatively high level. At this level it is taken across the projection room, through the two wire transmission line, to the main amplifying system.

Since the voltages induced in the two wire transmission line will be a *constant value*, regardless of the level of the signal energy being transmitted through it, it is apparent that by transmitting the signal energy at a high level the *ratio* of signal voltage to stray background voltage has been increased very considerably and, by this means, the output "hum" or noise level at the loud speakers has been reduced to a value which is ordinarily acceptable.

#### Coupling by Transformer

With the advent of the gas filled caesium cell having much greater sensitivity and power output, it has been entirely feasible and desirable to couple the photocell to the main amplifier by use of a specially designed transformer, entirely eliminating the sound head amplifier. This transformer is wound in such fashion that it matches the impedance of the transmission line to the impedance of the photocell proper. By using a carefully shielded line to connect the output terminals of the transformer (which is located in the sound head adjacent to the photocell) to the amplifier input terminals, the distributed capacitance of the link circuit is held to a minimum and the power efficiency of the photocell and the frequency characteristic of the connecting link circuit are maintained at suitable values.

When a transformer is used to couple the photocell to the main amplifier, the photocell signal voltages are "stepped down" to a very low value. This low voltage signal is taken, through the carefully shielded line, to the input transformer of the main amplifier where it is stepped up again to a value suitable for appli-

cation to the grid of the first stage. Thus the transmission line is operated on which might be termed roughly a "current" basis.

Operating the transmission line on a "current" basis does for the ratio of signal currents to currents induced by the stray magnetic field, the same thing as was done in the previous description in which the transmission line is operated as a voltage device by the insertion of the sound head amplifier located directly at the photocell. Modern practice has indicated that the use of a transformer coupled transmission line is more desirable than the use of a sound head amplifier. Difficulties from microphonic noise, caused by vibration of the sound head itself, are encountered in using sound head amplifiers.

This vibration requires that the sound head amplifier be very carefully suspended by means of springs. Rubber damping pads are often introduced in the construction of such sound heads equipped with amplifiers. Since all springs are essentially mechanical oscillators, some damping must be supplied in order that an effective mechanical filter may result. This is furnished by the rubber pad. The vacuum tubes used in the sound head amplifier must be of especially rigid construction in order to avoid noise caused by vibration of the tubes.

Briefly stated, both the amplifier and the transformer method of coupling the photocell to the main amplifying system are designed to accomplish the same object. The use of the transformer, in conjunction with the high sensitivity caesium photocell, has the advantage of simplicity, sturdiness and freedom from the microphonic noises caused by projector vibration.

#### Radio Tube Suit Ended

David Sarnoff, President of the Radio Corporation of America, made the following statement:

"An amicable understanding has been reached for the adjustment of the Clause 9 litigation pending between the Radio Corporation of America and a number of manufacturing companies in the radio tube field and the cases will be discontinued.

"In a number of instances patent infringement suits brought by the Radio Corporation of America have been pending against companies seeking damage in the Clause 9 cases. The active manufacturing companies that are parties to the settlement have recognized patent rights of RCA by acquiring licenses under its patents, and these patent infringement suits will be dropped. The Radio Corporation of America has also obtained rights for use both by itself and its tube licensees under radio tube patents owned by the DeForest Radio Company.

"The termination of this large num-

ber of suits, on terms satisfactory to all parties involved, will do much to free the radio industry from litigation with which it has been burdened and impeded for several years, and which entailed heavy expense to all concerned. It will enable the industry to devote more of its attention to the development of new products and new services for the public and should have a stimulating effect on business as a whole."

#### Philippines to Get H & C Lamps

Among the recent foreign shipments made by the Export Department of the National Theatre Supply Company, is a shipment of Hall & Connolly FR-10 lamps destined for Manila, P. I. This represents but one step in the increasing demand among foreign exhibitors for H & C products.

It is notable that the recently opened Earl Carroll theatre at New York City numbers a battery of six H & C spotlights among its stage lighting equipment.



# An Efficient Condenser System

By J. A. SCHEICK†

THE advent of the talking motion picture is usually regarded as augmenting rather than revolutionizing the mechanism of motion picture projection, and yet the use of sound equipment has wrought many changes in the apparatus of picture projection itself.

The fact was early realized that in order to secure perfect illusion it would be necessary to locate the loudspeakers behind the picture screen. This arrangement immediately nec-

the light reflecting qualities of the screen surface.

## Compensating Elements

In these days when larger houses, longer throws, and larger screens are increasingly the vogue, any appreciable loss in the reflective powers of the screen might be regarded as serious detriment, but fortunately rapid developments have in recent years been made in the field of projection lenses, light sources, lamp-house construction and condenser lenses.

With respect to this last item, painstaking and exhaustive research has led to the development of a new condenser lens combination permitting the delivery of approximately fifty percent more light to the picture screen than has been possible in the past. This claim is advanced by the Bausch & Lomb Optical Company, which has recently been granted Patent No. 1,783,481 covering the combination.

## Flexibility of the Combination

The new condenser is equally adapted for use with wide film and with standard 35 mm. film. The increase in illumination obtained through the use of the new combination is attributed by the manufacturers to the fact that it affords an increased solid angle of light which converges from the condenser to the aperture of the film gate, and also that it results in a conservation of illumination accruing from an oval instead of a circular spot of light, due to the fact that the oval conforms more nearly to the rectangular shape of the aperture.

The lenses are known as the 41-86-24 and 41-86-25 condensers, a combination of two lenses of which the 41-86-24, the rear lens, has one spherical and one cylindrical surface, and the 41-86-25, the front lens, one spherical and one parabolic surface. The 41-86-24 is 5½ inches and the 41-86-25 is 6 inches in diameter.

## Increased Illumination

The increased angle of illumination afforded by the combination is possible because of the size of the lenses and the high correction of the system. This angle amounts to slightly more than 24 degrees for a condenser to film distance of 12¼ inches. This is sufficient to fill practically the aperture of an f:2.3 projection lens. It is said that no condenser hitherto available has offered such an angle.

An important saving of illumination is achieved by means of the cylindrical surface on the rear lens (left hand surface in the illustration, Figure 1) which concentrates the illumination in oval spot. This oval conforms to the rectangular shape of the aperture much better than the wasteful circular spot produced by condenser systems in the past.

Special heat resisting glass is used in the manufacture of these new condenser lenses. This glass is made in the firm's own glass plant. It is remarkably free from the green color of some condenser lenses and is next



Fig. 2

to fused quartz in its freedom from breakage.

In Figure 2 is shown the set-up recommended for standard film and for wide film. The distance A from the arc to the condenser is measured from the rim of the crater to the centre of the rear condenser. Distance B is measured from the front lens to the aperture. These settings should be made and then, after the arc has been struck, adjusted to obtain the best results. The exact setting will vary slightly with the focal length and type of projection lens used, and with the exact thickness of the condensers, which will, of course, vary slightly in manufacture.

For standard film projection, it is recommended that these condensers be used with the 13.6 mm. high intensity arc at 125 amperes. For the projection of wide film, the 16 mm. high intensity carbons with a current of 150 amperes are to be preferred.

## Gregg and Dodge Appointed Div. Mgrs. of E. R. P. I.

The appointment of E. S. Gregg as General Manager of the Eastern Division and of H. W. Dodge as General Manager of the Central Division, has been announced by Electrical Research Products, effective September 15.

Gregg recently returned from England where he served for two years as Managing Director of Western Electric Co., Ltd., in Great Britain and European Manager for Electrical Research Products' interests on the Continent. Dodge has been Sales Manager of the Central Division for several months and before that was Merchandising Manager in New York.

Both men will report to H. M. Wilcox, Vice President.

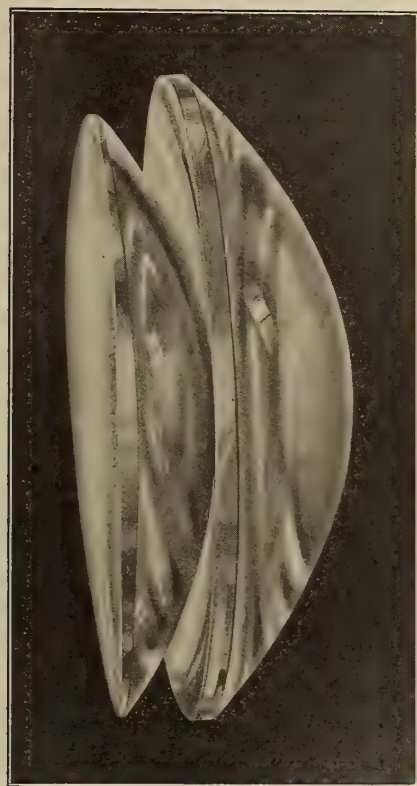


Fig. 1

essitated the use of a screen so constructed as not to obstruct the passage of the reproduced sound from the speakers to the theatre audience. Various methods have been devised with a view to accomplishing this effect, with the result that many so-called sound screens are now in use.

There are today numerous varieties and types of these screens which are admirably adapted for use with sound reproducing equipment. The vast majority of them utilize perforations in the screen surface itself or depend upon the porosity of the screen to permit the passage of the sound through the screen to the theatre audience. The use of a perforated or an extremely porous screen, however well-adapted it may be for the transmission of sound, must of necessity detract somewhat from

†Bausch & Lomb Optical Co.



# Selection and Use of Screens

By FRANCIS M. FALGE†\*

*Probably no unit of the equipment of projection receives less attention and is more deserving of consideration than the picture screen. In this paper Mr. Falge discusses the points to be observed in selecting and the correct manner of installing and using this important item of projection equipment.—THE EDITOR.*

**P**ICTURE presentation, especially since the advent of sound, is fraught with many difficulties, and the screen is by no means the least of these. The overcoming of all other difficulties—the light source, the film, the lenses, etc.—may all be for naught if the last one, the screen, should interfere. But the exhibitor often little realizes the importance of the screen. His projec-

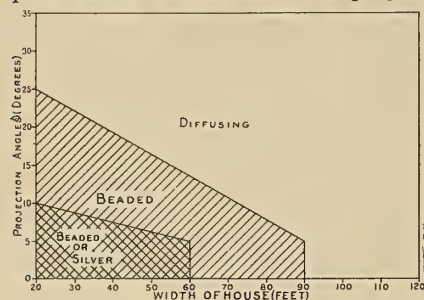


Fig. 1

tionists take care of all other equipment, but even they allow a dirty or imperfect screen to pass without comment. This not only means a loss of efficiency, but a loss at the box-office as well, because of dissatisfied patrons. The objective of every exhibitor, therefore, should be to keep his screen in as good condition as possible at all times.

When selecting a screen the following points, which will be discussed individually, should be considered:

- (1) Adaptability to the particular theatre;
- (2) Reflective efficiency;
- (3) Sound characteristics;
- (4) Durability;
- (5) Uniformity;
- (6) Fireproofing;
- (7) Illusion of depth;
- (8) Adaptability to color;
- (9) Size of screen required.

There are many kinds of screens, but all come within three general classifications. There is no screen made today which is an average type best suited to all houses. For that reason, screens should be selected which fit the characteristics of the particular house, bearing in mind the fact that theatres have very dissimilar characteristics. They may vary in width from 20 to 120 feet or more, and in length from 50 to 150 feet. They may have no balcony or they

may have three; the angle of projection may be zero or it may be 35 degrees, and the screen may be from 10 to 30 feet from the front row of seats.

## Types of Screens

There are three general types of screens: Diffusive or matte, reflective or metallic, directive or beaded. All three types of screens are made with openings to permit the passage of sound.

Fortunately, screen characteristics are so definite that consideration of the vital principles of each of these types should permit a ready decision as to the screen best suited to a particular house.

Practice seems to bear out the fact that a matte screen which radiates equally in all directions appears less brilliant the farther away the observer is from it. This may be due to the loss of light through the atmosphere, a smaller included angle of light, and the interference of light sources in the house. These factors in general tend to make the screen too brilliant for those in the front rows of seats, and not sufficiently brilliant for those in the rear seats. When selecting a screen, consideration should be given to these points.

## The Diffusive Screen

Diffusive screens are made of cellulose coated materials; rubberized fabrics; closely woven treated materials; coarsely woven materials with or without metallic fibers; woven materials with irregular glass particles; and coated metals.

The advantages of diffusive screens may be listed as follows:

- (1) They redirect a large percentage of light—i.e., they are very efficient;
- (2) They are good for color picture projection—i.e., they are not color-selective;
- (3) They redirect light through wide angles, giving satisfactory projection for wide theatres or for theatres with steep projection angles.

## The Reflective Screen

Reflective screens are made of aluminum and other polished and coated materials, and have varying degrees of diffusiveness. Their advantages may be listed as follows:

- (1) They build up the intensity of the reflected light so that under certain conditions they add to the apparent brilliancy as viewed from the rear seats;
- (2) Their use results in economies in projection in houses which have large ratios of length to breadth.

The disadvantages of reflective screens are:

- (1) They are not desirable where the angles of projection are greater than 10 degrees;
- (2) They can be used in relatively few houses;
- (3) They are not satisfactory for the projection of colored pictures—i.e., they are color-selective.

We may conclude, therefore, that reflective screens are useful for few houses because of prevalent conditions and their limited reflection angles. Also, they are not good for color picture projection.

## The Directive Screen

Directive screens are diffusing screens on which are imbedded glass globules; they are also called "beaded screens."

Their advantages may be listed as follows:

- (1) They build up the intensity of the reflected light so that a more brilliant picture can be seen from the rear seats;
- (2) They redirect the light so that spectators in the balcony the picture appears as good as to those on the main floor;
- (3) They redirect the light in such a manner as to result in decided economies;
- (4) They assist in the illusion of the third dimension;
- (5) They can be satisfactorily maintained, and retain much of their original brilliancy;
- (6) They reduce the glare seen from seats near the screen;
- (7) Because of their apparent brightness, they add life and brilliancy to color pictures.

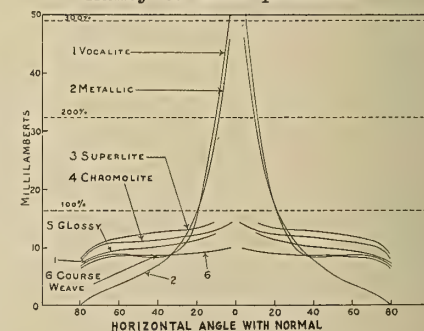


Fig. 2

The disadvantages of directive screens are:

- (1) They are not desirable for theatres having projection angles greater than 20 degrees because of their directive nature;
- (2) They are not desirable for wide houses.

In conclusion it may be stated that beaded screens, while very efficient, redirect the light and provide a more satisfactory picture in houses of me-

†The Beaded Screen Corp., New York, N. Y.  
\*Courtesy of the S. M. P. E. Journal.

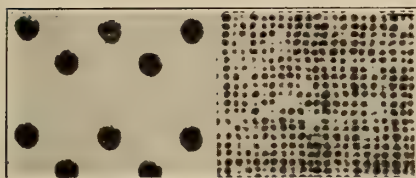


dium width having projection angles up to 20 degrees. Because of the great brilliancy and the decided contrasts, the tone qualities of the picture are enhanced, especially in the case of color pictures. Beaded screens also redirect the light so as to provide those in the balcony with as good a picture as those on the main floor.

#### Selection of Screen

Invariably, it is a mistake to select a screen for one theatre by viewing a screen in another theatre. The many whims of projection equipment all contribute to mislead the observer, and in the final analysis, the characteristics of the houses will probably differ so much that a proper choice is impossible. Then, too, our eyes are not trained to evaluate the brightness in cases such as these.

Consideration of the foregoing analysis, the charts of Fig. 1 and Fig. 2, and the physical characteristics of the particular theatre for which the screen is intended, will permit the se-



Perforated Porous-Beaded  
Fig. 3

lection of the best type. The other factors which follow will assist in making the proper selection of the best screen of that type.

#### Reflective Efficiency

The total reflection of light from a screen, apart from measurements of its reflection characteristics in various directions, is very important, as it is on this factor that one phase of efficiency depends. Of two similar types of screen, the one with the highest over-all efficiency is likely to prove best. The reflective efficiency of the screen is closely linked with the reflective efficiency of the coating material, titanium pigment being an excellent white reflective pigment. Aluminum, on the contrary, has relatively low efficiency, and consequently metallic screens are usually of low efficiency. Light tests of screens should include measurements of reflective efficiency.

#### Sound Characteristics

In practically all cases, horns are now placed behind the screen, the sound passing through the screen *via* interstices in woven cloth or perforations in opaque material. When this method was first used, the matter of sound transmission was considered all-important, compared with other considerations, and the picture suffered decidedly. It was later found that a relatively small percentage of open space—as low as 4 per cent—could be used, the present compromise

TABLE A			
Description	Picture	Screen	Inside of Frame
Standard	9'0" by 12'	9'6" by 12'6"	10'6" by 13'6"
Substandard	10'6" " 14'	11'0" " 14'6"	12'0" " 15'6"
Standard	12'0" " 16'	12'6" " 16'6"	13'6" " 17'6"
Substandard	13'6" " 18'	14'0" " 18'6"	15'0" " 19'6"
Standard	15'0" " 20'	15'6" " 20'6"	16'6" " 21'6"
Substandard	16'6" " 22'	17'0" " 22'6"	18'0" " 23'6"
Standard	18'0" " 24'	18'6" " 24'6"	19'6" " 25'6"
Magnoscope	24'0" " 36'	25'0" " 37'0"	26'0" " 38'0"
"	26'0" " 40'	27'0" " 41'0"	28'0" " 42'0"
"	28'0" " 40'	29'0" " 41'0"	30'0" " 42'0"

being about 8 per cent. An arbitrary figure of approximately 3 decibels loss was decided as allowable by Electrical Research Products, Inc. The RCA and other manufacturers have allowed somewhat greater tolerances.

Considering the great losses in other parts of the system, such as in the horns, the allowable loss for screens would seem rather severe, but fortunately, a fairly good picture can be produced on a screen meeting this requirement. Also, because of varying methods of test, it does not seem possible to make two tests that check, so that, under the present system, the value of these tests is questionable.

Fig. 3 is given as a matter of interest, showing the openings in a porous and a perforated screen, magnified 100 times.

#### Durability

Under this subject the following factors must be considered:

- The ability of the screen to withstand abuse, during handling and hanging;
- Its strength at the seams;
- The effect of dirt collection;
- The effect of washing and reprocessing.

The abuse that the average sound screen receives is astonishing. When hanging the screen, often too little care is taken, and there is always the possibility of tearing or damaging the surface. Accompanying all new screens are carefully written instructions which are very valuable to the exhibitor in regard to saving time and obtaining the proper service from his screen. Ruggedness of material is a factor to consider in selecting a screen, but any screen is likely to suffer because of abuse. Furthermore, ruggedness seems to play no part in its life, as other factors, such as the collecting of dirt and method of maintaining the screen, are more important. The seams should be as strong as possible, but no seams will withstand considerable abuse.

The accumulation of dirt, the washing of the screen, and methods of reprocessing it are the factors which determine the life of a sound screen. If properly maintained, screens may have an effective life of one and one-half to two years. The average effective life of a sound screen is one year; screens kept in service longer

than this handicap the exhibitor to a considerable extent unless they are properly and regularly serviced.

#### Uniformity

Two factors must be considered under this heading: (a) the uniformity when new, and (b) the uniformity after being used a while and after cleaning or reprocessing.

The slightest imperfection in weave or variations in depth of coating may result in a non-uniform surface; this may happen even when the greatest of care is taken. Panels must therefore be carefully matched and inspected to see that they are of the same color and are free from imperfections.

The processing must be so uniform and exact that surface conditions and time will not cause a lack of uniformity. All screens in use today become yellow with age to a certain extent. If the yellowing is uniform, it is not likely to be objectionable. Improper cleaning or reprocessing may introduce streaks and imperfections, and may considerably increase the tendency to become yellow. At the time of processing, the screens may have a uniform appearance, but when

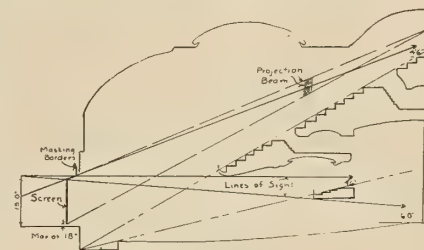


Fig. 4

dry the imperfections will gradually appear. Be sure that this is given consideration before allowing a screen to be resurfaced.

#### Fireproofing

Some time ago, because screens were made of highly inflammable cellulose materials, considerable agitation was raised in certain quarters concerning fireproof screens. By adding certain ingredients and eliminating others, the various screen coatings were made fire-resistant. Fabrics are best made fireproof by impregnating them. A slow-burning material, however, when stretched vertically, does not constitute a fire hazard; but if a fire-resistant material is



TABLE B

Light Source	Screen	Throw	Picture
Mazda	Diffusive	100 ft.	12 × 16
"	Beaded	100 "	15 " 20
Low Intensity	Diffusive	125 "	15 " 20
"	"	175 "	12 " 16
"	Beaded	125 "	18 " 24
"	"	175 "	18 " 24

selected, there need be no fear of objection by local inspectors.

Successful fireproofing of a screen immediately after it is made or while in place in the theatre has not yet been accomplished. Screens are such a small item of the stage equipment, and so much less inflammable, that there need be no fear of fire from them. In general, it is best for each exhibitor to choose his screen according to his local ordinances.

#### Illusion of Depth

The illusion of depth is a very debatable matter; it seems to be connected with the method of photog-

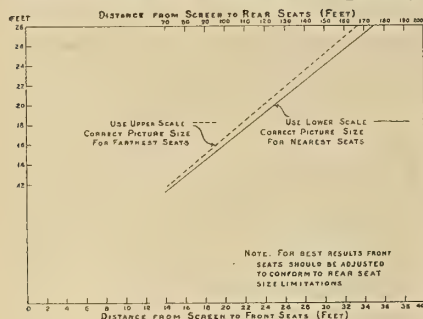


Fig. 5

raphy used. By obtaining the proper contrast between highlights and shadows, an illusion of depth seems to be created. Beaded screens have been selected for wide film projection in a number of instances because of this feature.

#### Adaptability to Color

Color brilliance and purity is, to a considerable extent, dependent on the light intensity. For this reason a bright screen will, in general, if of neutral character, give better results for all colors than a screen which is less bright. For colors, screens should have no tint other than that which is required to neutralize the color of the light source, assuming that it has a definite color. A metallic screen is usually quite color-selective, whereas beaded and white diffusive screens are neutral in character. Closely paralleling this problem is that of obtaining the correct tone quality of the reflected picture. Attempts to tint the screens in order to impart a certain tone quality to the picture are likely to be undesirable when colored pictures are projected, and because of the different qualities of the various are sources themselves.

The problem of choosing the proper size of screen is an important one. A new installation is the simplest to plan, but when a theatre needs a new

screen, the problem should be carefully considered. The problem is of sufficient importance to warrant the replacing of the objective lens if a different size of screen seems desirable.

A system of standard screen sizes is highly desirable, and will result in economies and other advantages for both the exhibitor and the manufacturer. Less wastage results, errors in ordering are made less frequently, shipping is expedited, cleaning is facilitated, and costs and prices are consequently reduced. The Projection Screens Committee of the Society of Motion Picture Engineers is now developing recommendations for standard sizes. Information based on standards adopted individually by large circuits and manufacturers is shown in Table A.

Wherever possible a standard size should be substituted for a non-standard. When ordering screens, the three dimensions should be given; prices are based on picture sizes.

#### House Conditions

Theatres are planned with definite lines of sight, and care must be taken to keep the screen in the line of vision, especially when using a screen modifier. Older theatres generally used a line of sight which provided a clear view of 16 feet from the stage floor at a point 4 feet back of the curtain line, which therefore often limited the size of the screen to 15 by 20 feet. Newer theatres often allow for a considerably greater height. The accompanying diagram (Fig. 4) illustrates these limitations.

The distance from the front row of seats to the screen is one of the determining factors for the size of the screen. The larger the picture, the worse will the imperfections, such as graininess in the film, appear. These imperfections are very noticeable and objectionable to spectators sitting close to the screen. The eye can satisfactorily accommodate itself over an angle hardly more than 45 degrees, so that the distance of the front row from the screen should be approximately 15 inches for each foot of screen width. For a 15-foot picture, a distance of at least 18½ feet should therefore be provided.

The size of the picture should also be determined by its distance from the rear seats. The width of the screen should be approximately 1/6 the distance from the screen to the rear seats. For a distance of 120

feet, therefore, a 20-foot picture should be provided. Fig. 5 shows curves which may be used in determining the proper size of the picture.

#### Projection Equipment

The intensity of the lamps, the perfection of the optical system, and the length of throw should also aid in determining the size of the picture. Here, however, the character of the screen must be considered. If it is of the beaded type, in a house adapted to it, a considerably larger picture can be used because of the increased brightness of the picture as seen from most seats.

It is a fact that the smaller the screen, under a given set of conditions, the brighter it appears. For this reason there is a definite maximum limit to the size of the picture when using Mazda or low-intensity arc lamps of 18 to 28 amperes. Practical tests have determined these sizes to be as indicated in Table B.

This table is based on the best figures available at this time regarding screen illumination, which varies from 3 to 7 foot-candles with the shutter in operation, for a picture of average size. For Hi-low and high-intensity light sources, there seem to be no limitations beyond the reasonable ones already placed.

It should be remembered that when a given light source at a given distance is used to project on a larger screen, the screen brightness will be lessened, just as a 25-watt lamp in a small room will light a theatre auditorium much less brightly. A 12 by 16-foot screen having an area of 192 square feet is almost twice as bright as a 15 by 20-foot screen having an area of 300 square feet, under the same conditions. Therefore, if a screen is not already more than bright enough, a change to a larger screen should not be considered unless it is to be changed to the beaded type.

#### Large Pictures

Practical showmanship is responsible at times for causing exhibitors to do things that may not be technically correct. The excitement about large pictures (which was accomplished practically, but not satisfactorily, by merely changing the sizes of screen and picture) caused the exhibitors to feel that it is necessary to have a larger screen than is ordinarily desirable. The maximum size of picture, except in unusual cases, should be 18 by 24 feet. If a screen modifier is to be used, there must be sufficient difference between the sizes of the small and large pictures to make the effect worth while. A change from a 20 by 26-foot picture to a 24 by 36-foot picture would not be desirable; however, a change from a 15 by 20-foot standard picture would provide the desired effect.

Local conditions determine to a

(Continued on page 36)



# Some Aspects of Loudspeaker Development

By W. L. WOOLF†

*In the following article, the second in the series, Mr. Woolf discusses the development of the loudspeaker diaphragm. The author treats his subject in an interesting and thorough manner, describing the work and citing the various inventors who have contributed to the improvement of this vital element of the speaker unit.*

—THE EDITOR.

## Part 2

AS stated in the previous installment, the principal member of the loudspeaker is the vibrator, be it a cone or diaphragm. Assuming we have available a motor of a type capable of imparting to the diaphragm, vibrations of the amplitude and frequency desired, what form of diaphragm shall we adopt and of what

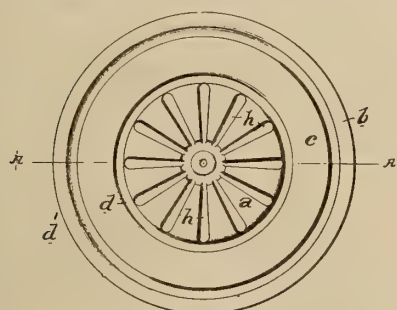


Fig. 1

material shall we make it in order to give us the highest efficiency and best tone quality? It is the purpose of this article to answer the above questions by examining the works of investigators in the phonograph, telephone and radio industries, during the past half century. An examination of the works of these men is most interesting. Occasionally we find one of them who possessed such a clear conception of his problem that his patents foreshadow or anticipate his followers for years to come. Others have apparently had little knowledge of the greater problems, but have contrived to hit upon some minor improvement real or imaginary that is a special case of a broader theory.

### Early Forms of Diaphragms

The earliest diaphragms were flat. It became evident at an early date that these flat diaphragms were not ideal. The thrust of the energizing force warped them out of shape, resulting in a distorted sound wave as well as in a distorted diaphragm. To prevent this warping, it became evident that the centers of diaphragms must be made stiffer. Edison in 1891 patented two diaphragms, one consisting of a tapering disc made of a single piece of metal, the thickness diminishing from the center to the periphery.

Of this diaphragm Mr. Edison said: "The advantages of the invention may, in a measure, be secured by constructing the diaphragm in one solid piece, made thickest at the center of the diaphragm and tapering gradually and uniformly to the edge, although this is a much more expensive construction than the composite form." The composite form referred to is described by Mr. Edison as follows:

"I construct a composite diaphragm made up of a number of disks of graduated sizes cemented together, so as to form a diaphragm which is thickest at the center and thinnest and most sensitive at its periphery, where only one of the disks (the largest) is present. These disks I also preferably make of varying thicknesses, the largest disk being the thinnest and the smallest the thickest, while the intermediate disks are of intermediate thicknesses. The diaphragm is clamped at its edge, as usual, in the supporting frame of the recorder or reproducer, and in the operation of the instrument moves bodily, thus producing a greater amplitude of vibration than is secured with a diaphragm of uniform thickness throughout, which my experience shows moves only at its central portion, since it is there most flexible and elastic."

### Stiffened Central Portion

In 1901, Augustus Dewelius, invented a diaphragm in which he described, "a non-flexible area produced by adding a stiff disk to either side of the diaphragm or by corrugating or embossing the diaphragm itself or by scoring it or in many other ways and forms. The ratio of the non-flexible to the flexible area of the

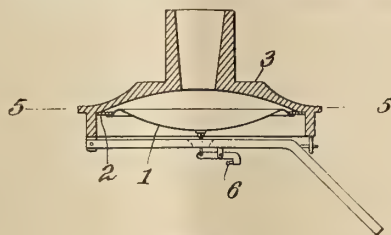


Fig. 2

diaphragm will depend upon the nature of the materials employed, but should be as great as permissible in order to produce vibration over the largest area possible."

### Flexible Peripheral Portion

With the center of the diaphragm stiffened so that it could not flex, it became necessary to produce flexibility at the periphery in order to permit adequate amplitude of vibration. In 1900 Mobley produced flexibility at the periphery by producing

a curve surrounding the diaphragm spaced a short distance in from the periphery. Both these factors, namely, the stiffened central portion and the flexible peripheral portion were adopted by many inventors from 1900 to the present time.

### Combination of Both

Mobley employed such a diaphragm in 1901. In 1906, he contributed the diaphragm shown in Figure 1, h shows a series of radial corrugations

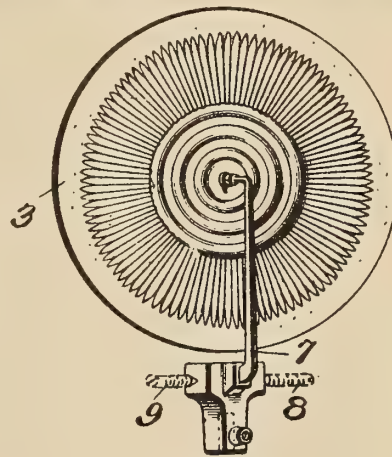


Fig. 3

whereas d and d<sup>1</sup> are circumferential corrugations. The radial corrugations h are designed to stiffen the central portion and corrugations d and d<sup>1</sup> to make more flexible the peripheral portion. This diagram is a forerunner of diaphragms found in balanced armature units in great quantities manufactured during the years 1922 to 1925.

English patented diaphragms with central stiffened portions and flexible peripheral portions in 1908 and 1909 and Edison in 1910. Figure 2 is one of the several diaphragms patented by Edison in 1910.

McDonald in 1912 and Weber in 1913 patented a number of complicated shapes designed to give great stiffness to the central portion and great flexibility to the peripheral portion (See Figure 3). In 1913 Catucci patented a series of diaphragms with cross corrugations with much the appearance of the present day waffle iron. These corrugations were stamped into both flat diaphragms and arched or dish shaped diaphragms.

A recent diaphragm of great rigidity capable of radiating tremendous power and yet weighing less than 1/40 of an ounce is shown in the Amplion Diaphragm Figure 4.

Another excellent diaphragm was patented by Edison in 1915. A domed shaped central portion distributed the central thrust of the stylus over a large circular area. Mob-

†Amplion Products Corp.



ley produced an excellent specimen of the diaphragm under discussion in 1915, Davis in 1921 and Scharf of Germany in 1923. In the Scharf diaphragm the periphery was attached to a soft material permitting great flexibility. Baldwin patented a series of such diaphragms of excellent tone quality in 1924.

#### Eccentric Diaphragms

In an endeavor to create a diaphragm which would reproduce a wide range of sound frequencies, many investigators have either driven their diaphragms off the center or have made the diaphragms oval, elliptical or elongated, the theory being that the short side of the diaphragm would reproduce the high frequencies and the longer axis the low frequencies. While this theory is of doubtful value, it is entitled to a hearing here, because of the number of investigators who have accredited it.

In the Dewelius diaphragm mentioned above, Dewelius states that "by locating the non-flexible area in a position eccentric to the main portion of the diaphragm, the practical effect is to impart a different kind of movement thereof and to produce better results. Thus when so located the resistance to its movement becomes unequal and that portion of its periphery and surface nearest the edge or rim of the diaphragm, offers the greatest resistance to motion and becomes to a greater or less extent depending upon the degree of eccentricity, a fulcrum, in other words, the

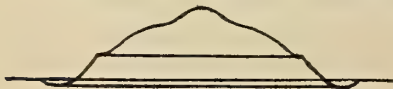


Fig. 4

non-flexible area becomes in effect a musical reed.

Miller patented a diaphragm in 1908, shown in Figure 5. Mr. Miller says, "In using all forms of diaphragms shown, I propose to connect the reproducer stylus with the geometrical center of the diaphragm. The diaphragms are, however, unsymmetrical as regards their rigidity or resistance to flexure, the resistance being greater on one side of a median line than on the other; that is, the diaphragm is stiffer on one side of said line than on the other. The effect of such construction is that the stress applied by the stylus to the center of the diaphragm produces the greatest amplitude of vibration at a point at one side of said center, instead of at the center as in symmetrical diaphragms. The point at which the greatest amplitude of vibration occurs I term the acoustical center of the diaphragm."

#### Tangential Corrugations

Another group of investigators has championed the idea of making corrugations tangential to a central stiffened portion for the purpose of adding greater flexibility to the periphery.

An early patent advocating this theory was taken out by Van Mater in 1905. In 1912 Ellis invented a diaphragm, the "object of which was to provide a diaphragm constructed of a single sheet of resilient material rendered more flexible at its peripheral or marginal portion by lines of scoring."

"The direction of the scoring lines were such that the distorted sectors

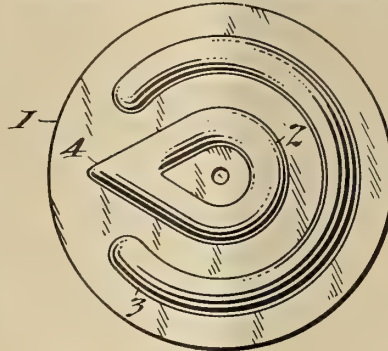


Fig. 5

between them had the appearance of being twisted and were of greater length than if described by radial lines. Their greater length gave a greater resilience to the diaphragm as a whole but because of the scoring lines becoming deeper and wider as they approached the edge of the disk, the degree of flexibility became greater as the edge or margin of the disk was approached. This was further assured by the presence at the marginal portion of the disk of supplemental scoring lines. Mr. Ellis claimed as his invention a diaphragm comprising a disk having curved arc shaped lines of varying depth formed therein, approximately radial and tangent to a circle concentric with the disk."

Hess employed this theory in a highly complicated diaphragm stamped with rows of circular figures decreasing in diameter and depth from the periphery to the center and located on radial arcs tangent to the central portion.

In 1927 Harrison employed a diaphragm with a tangentially corrugated peripheral portion. The tangential corrugations adding to the flexibility of the periphery.

#### Driving Force Applied at Points Surrounding the Centre

A great majority of investigators favoring diaphragms with stiffened centers, preferred a dish shaped stamping to a solid single piece of metal of equal stiffness. With the dish shaped stamping, great rigidity was acquired with exceedingly thin metals of light weight. With the development of this type of diaphragm, it becomes increasingly apparent that greater force can be applied to the diaphragm without distorting its shape, if the force is applied at several points removed from the center instead of at the center alone. Bettini recognized this truth as early as

1889. In his patent of that date, he states, "the object is to record articulated speech and other sounds and reproduce them with great amplitude and distinctness."

The invention consists in the method of reproducing sound or sounds by causing any suitable record to act at a single point or place and from this point or place, causing vibrations at several points or places of a body capable of vibration, and the invention consists finally in the method of recording and reproducing sound or sounds by taking vibrations off a vibrating body at several points or places, communicating them to a common or central point or place, causing a record to be made from this common point or place and then from this record causing vibrations at a common point or place and communicating these to several parts of a body capable of vibration."

This description will be better understood if one pictures the "common or central point or place to be a phonograph needle." The several points capable of vibration are several points on a diaphragm located on the circumference of a circle drawn about the center of the Bettini diaphragm. Energy in the Bettini invention was transferred from the needle to the diaphragm by means of a "spider," the legs of which connected from the needle to several points of the diaphragm.

In 1901 Norcross used a hollow dish or cup described by him as a "hollow boss," which he attached either centrally or eccentrically to a diaphragm. The stylus or needle was attached to the "boss" its energy being transferred through the "boss" to the diaphragm.

In 1898, Sir Oliver Lodge described a loud speaker of the movable coil or dynamic type in which he attached the

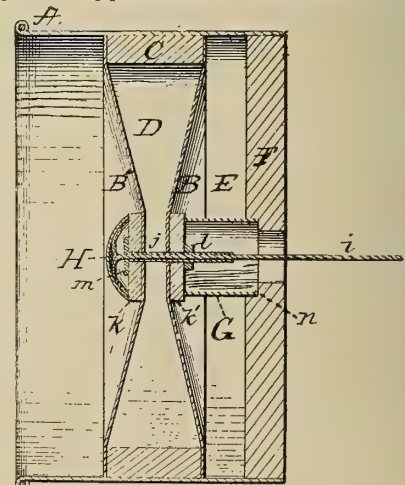


Fig. 6

movable coil to the diaphragm. This permitted the driving of the diaphragm at points removed from the center. In 1910, Oliver invented the movable coil telephone in which a voice coil was attached to the diaphragm.

(Continued on page 34)



# Efficient Sound Reproduction

By R. H. McCULLOUGH

*Supervisor of Projection, Fox West Coast Theatres*

**I**N the average theatre of today, sound is reproduced with minimum distortion. Amplifiers have been constructed along battleship lines with enormous safety factors to assure permanent trouble-free service over a relatively long period of time. There is no reason why sound cannot be reproduced similar to the original source. The reproductive qualities of the present sound reproduction is the result of technical achievement.

Many sound equipment amplifiers are designed to operate on 110 volts alternating current. In many localities the voltage varies between 90 and 130 volts, depending upon the locality, load upon the line, transformer equipment, time of day and other factors beyond the control of the power company and the designer of the apparatus. Thus the actual voltage applied to a sound equipment amplifier may vary within wide limits, either momentarily, due to a sudden heavy load upon the line, or steadily as in the case of a voltage drop due to a long transmission line.

Vacuum tubes operated below the specified voltage provide poor tone quality and weak volume. High line voltage will result in distortion, also will cause serious injury to the amplifier's component parts such as transformers, resistors and vacuum tube filaments. If the line voltage maintained a drop in voltage, it might be compensated for by the use of a properly designed low-voltage transformer.

## Voltage Fluctuations

Unfortunately, however, alternating current line voltages rise as frequently as they drop, making it impossible to employ low-voltage transformers, since any increase above normal would seriously overload the vacuum tubes and component parts, which would result in disrupted service. The tapped transformer with a choice of two or more voltage ranges, adopted by some sound equipment manufacturers, was a half-way improvement. It was a relief measure, but by no means a cure, being unable to cope with line voltage fluctuations. There are several types of voltage regulators on the market, all intended for the same purpose, some cover wide limits and others do not cover wide enough limits.

The Fox West Coast Theatres have adopted the use of a special voltage regulator, which consists of a step-up and step-down transformer—a fixed resistance and a volt meter. This type of a voltage regulator operates on the automatic compensation principle.

The voltage may be regulated at any time, so that a normal voltage of 110 volts may be obtained. After the voltage regulator is once set the series resistance maintains the applied voltage at correct and uniform value irrespective of line voltage variations, fluctuations and surges.

When the line voltage is high, the resistance is likewise high, causing necessary voltage drop for safeguarding the vacuum tube filaments and the component parts of the amplifier, such as filter condensers, resistors and power transformers. When the voltage is normal or subnormal, the resistance is slight, causing small voltage drop. This resistance also serves as a choke, thus reducing line noises to a minimum. Incorrect grid bias, incorrect plate voltages, incorrect input and output voltages, have been the cause for poor sound reproduction with many sound installations.

## Care of Vacuum Tubes

The life of a vacuum tube is seriously reduced if the filament current is too high; the reason for this is that an overheated filament throws off electrons at an excessive rate and the oxide coating, which supplies most of the electrons, therefore becomes rapidly exhausted. When a filament is near the end of its life, a weak spot usually develops which glows more brightly than the remainder. Whenever a tube begins to show this symptom it should be replaced by a new tube from the spare stock. If the filament current is too low the tube will not be harmed, but the system will not deliver proper volume and the quality may be impaired—therefore, always regulate the filament current carefully to the value specified by the manufacturer.

In some amplifiers, two or more vacuum tubes are operated with their filaments in series; if one of the tube filaments burns out the others will also be extinguished. It is advisable for every projectionist to study the schematic of each amplifier, so that he will be familiar with each and every condition when trouble is encountered.

## 79-A Visitron and 3-A P. E. Cell

Sufficient time has elapsed since the installation of the 79-A Visitron and the 3-A Photo Electric Cells to show us the ultimate limits of service which can be expected from these new type of Photo-Electric Cells. The average life of the 1-A or 2-A potassium cells was from eight to twelve months or less if kept in too high a

temperature. However, the 79-A Visitron or the 3-A cells have shown no appreciable deterioration regardless of where they are stored or operated. This new type of Photo Electric Cell is much more efficient than the 1-A or 2-A cells. A highly important advantage gained from the greater efficiency with the use of this new type cell has been the reduction in system noise. The response from this new type cell is much greater and the amplifiers can be operated with reduced gain; thus, reducing the volume level of any noise producing element within the system. This makes the new cell an important factor by enabling sound reproducing equipments to do full justice to recordings made by the new noiseless process.

The 79-A Visitron and the 3-A Photo Electric Cells consist of a half cylindrical electrode coated with caesium oxide. A small vertical rod forms the positive electrode. The former cells employed as the photo-active element, consisted of a potassium preparation coated on the inside of the bulb, with a ring shaped member forming the positive electrode.

## Sensitiveness of Photocell

The sensitiveness of a photo-electric cell—that is, the current it will pass for a given amount of illumination usually varies with the color of the illumination. Therefore, it is necessary to consider the relation that exists between the characteristics of the photo-electric cell and the light used to operate it. In apparatus for reproduction from sound recorded on film the most practical type of exciting lamp is a metallic filament incandescent lamp. Most of the light produced by sources of this type consists of yellow, red and infra-red radiations, there being comparatively little blue or violet radiation.

The photo-electric cell is much more sensitive to some parts of the spectrum than others. In the case of the potassium cell, the sensitiveness was greatest for blue and violet radiation. The greater part of the light produced by the exciting lamp was therefore not utilized. The caesium cell, however, is highly sensitive to radiation within the range produced most abundantly by the exciting lamp, namely yellow, red and infra-red. The 79-A Visitrons and the 3-A Photo Electric Cells have greater efficiency amounting to approximately 20 decibels higher than the 1-A and 2-A Photo Electric cells.



# Outline of Sound Recording

By GEORGE DOBSON†

*In this the second installment of his treatise on Sound Recording, which began in the September issue of this publication, Mr. Dobson takes up the subject of the amplifier, its purpose and its relation to the recording system. The author explains in a lucid and fundamental manner, precisely what happens as the signal passes from the pickup equipment into and through the amplifier stages.—THE EDITOR.*

## Part II

FROM the volume control, the voice currents go to the main amplifiers in the amplifier room (Figure 5). These vacuum tube amplifiers are usually considered the heart of the recording system since without them it would be impossible for the equipment to work, as the pick-up instruments supply insufficient energy to operate any type of sound recorder yet developed. Actually, the amplifiers increase the energy received from the pick-up instrument over 100,000,000 times, although part of the increase is used up in the circuit.

All motion picture projectionists are familiar with the general appearance of amplifiers and have probably noticed the differences between the small amplifiers, which are connected

to the photoelectric cells, and the larger amplifiers used later in the theatre circuits. The reason for these differences lies in the amount of power handled by the several tubes. When the amount of power is small, the tubes are likewise small. As the amount of power increases, the size of the tube necessarily increases, although not in like proportion.

In recording work, the received power is small even compared with that from a photoelectric cell, therefore, the smallest available types of tubes are used in the first stages of the amplifiers. The question naturally occurs—Why use a number of tubes connected one after another? Why not use a single tube to obtain the amplification needed? The answer is that we cannot yet (if ever) build a tube, having sufficient amplification, strong enough to handle the large currents which large power requires and not produce appreciable tube noise.

## Additional Elements

In addition to the vacuum tubes, the amplifier consists of the condensers, resistances, impedance coils and transformers necessary for connecting the tubes together, so that the output of one tube may be used to control the energy flow in the next

one—this, of course, is the essential principle of the vacuum tube amplifier.

It is necessary that all these parts be so designed, electrically, that they will work together, otherwise much energy will be lost and the sound waves distorted. It is rather difficult to grasp the need for this matching of parts but perhaps a water analogy will help. Anyone who has watched water enter a large tank from a small pipe, or flow out of a bath tub into a small drain pipe, has noticed that as a rule the water does not flow smoothly, but is broken up by many swirls and eddies. Smooth flow would be analogous to the transfer of power from one part of an electrical circuit to another without change.

The turbulence would represent distortion in the speech currents and the loss of pressure due to this turbulence (which although not apparent to the eye is easily measured by means familiar to hydraulic engineers) would represent the loss of energy in the transfer. Therefore, it is necessary to adjust properly the electrical characteristics of the various parts of the circuit so that the impedances are properly matched, just as in a well designed hydraulic equipment the changes in the shape and size of the pipe are designed to

†Commercial Engineering Dept., Electrical Research Products, Inc.

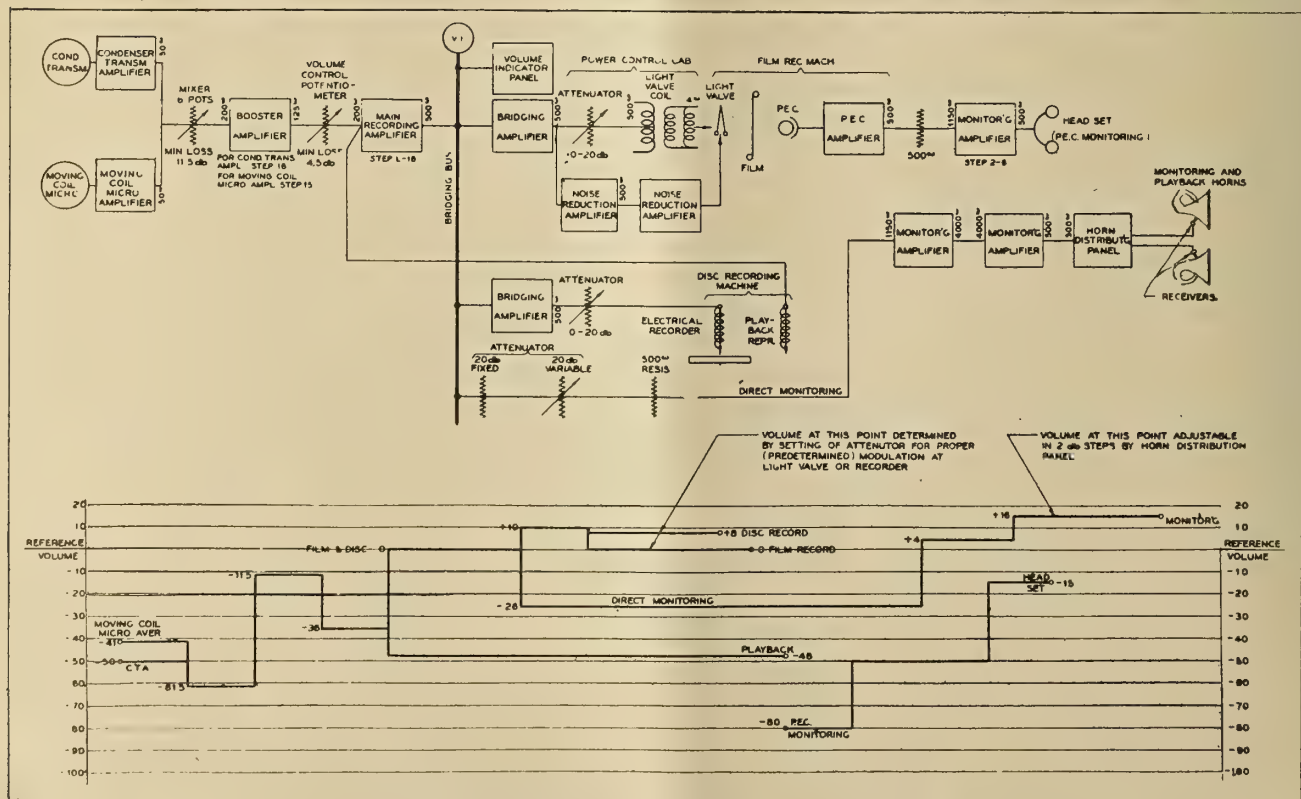


Fig. 5. Sequence of Apparatus and Volume Levels



avoid the swirls and eddies which would otherwise occur.

#### Perfection Not Easily Obtained

Such design is by no means as easy as it looks. It is quite easy to design circuits that are 90% satisfactory, but as we get nearer and nearer to the Ivory soap ideal (99.44% pure) the design becomes more and more difficult and the manufacture of the equipment correspondingly expensive. In many cases, apparatus is not available which will make the realization of ideal conditions possible without the use of corrective measures, but the harrowing details should be reserved for the design engineer as they are of little interest to the user.

Should any of the tubes be overloaded—that is, required to handle too much energy—"non-linear distortion" occurs and the resultant sound seems "fuzzy". This is due to the introduction of higher pitch notes, or harmonics, which are not ordinarily present in the sound.

Summarizing, we can say that an amplifier consists of a number of vacuum tubes and other apparatus so arranged that when an electric current is impressed upon the grid of the first tube, the output at the other end of the amplifier is a similar electric current very much magnified. The number and size of tubes necessary to produce the required amplification will depend both on the strength of the current which is impressed upon the amplifier and the strength of the current which is required from the output.

In some cases it is convenient to have all the tubes and their associated apparatus assembled on a single

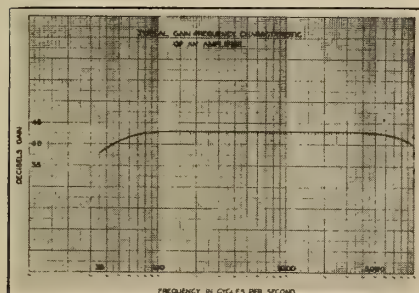


Fig. 6. Frequency Characteristic of a Typical Recording Amplifier

plate or in a single container. In other cases, particularly where large and high voltage tubes are used, it is more convenient to separate the amplifier into several units, which are properly connected together by external wires.

#### Power Sources

It is probably apparent from the above, that to supply an increased current at its output, the amplifier must draw electrical energy from some source other than the controlling input. In recording, this energy comes from storage or dry batteries which supply the vacuum tubes with low-voltage current to light their fila-



Fig. 6. The Amplifier Room

ments and with high-voltage current for their so-called "B" or space currents. In reproduction, it is very often convenient to use current obtained by rectifying the usual A. C. power supply by means of additional vacuum tubes.

Unfortunately, any particular amplifier does not magnify all frequencies in exactly the same proportion and great care must be taken to so design the amplifier that appreciable departures from uniform amplification will not occur within the range of frequencies needed for satisfactory reproduction. While the human ear can hear frequencies from about 20 cycles per second to about 20,000 cycles per second and while the closer we approach this range, the more nearly perfect the reproduction that is obtained, most of the sounds which are needed in speech and music and in many "effects" lie within the range of, roughly, 60 to 6,000 cycles. Quite good reproduction can be obtained if the recording is reasonably "flat" within these limits. Figure 6 shows the frequency characteristic of a typical recording amplifier which, it will be seen, meets the latter requirements.

#### The Decibel Defined

Figure 5, in addition to the circuit connections of the principal pieces of apparatus, gives the power requirements (or volume levels) of a typical studio recording system. The power is measured from an arbitrary reference level, sometimes called "Zero volume level", which is the electric circuit, when a person with an average voice is talking over that circuit. Departures from this reference level are measured in decibels (or "db").

These decibels are simply another way of expressing power ratios so

that each time the power is doubled, it is said to increase approximately 3 db and each time it is halved, it is said to decrease approximately 3 db. Expressed exactly, the number of db from the reference power (or volume) is equal to ten times the logarithm to the base ten of the ratio of the power (or volume) being measured to the reference power (or volume). In practice, tables are used to obtain the correct value. (See Table 1.)

It should be noted that volumes indicated by Figure 5 are those required in the Western Electric system of sound recording. Other systems may require somewhat different volumes, although the amount of power available at the sound pick-up microphone will not materially change and the amount of power necessary for the recording will probably not differ over 10 db from those shown.

#### "Feed Back" And Its Prevention

It is well known that currents in one electrical circuit tend to induce currents in other circuits and also in other parts of the same circuit. When this "feed back" occurs in a circuit containing amplifiers, circulating cur-

(Continued on page 41)

TABLE 1

Power Ratios	Expressed in Decibels
Power Ratio	DB
100 000:1	50 above
10 000:1	40 above
1 000:1	30 above
100:1	20 above
10:1	10 above
5:1	7 above (approx.)
2:1	3 above (approx.)
1:1	0
1:10	10 below
1:100	20 below

etc.



# Theory and Fundamentals

By W. W. JONES

*Mr. W. W. Jones, whose Department is a monthly feature of this magazine, has long been actively associated with the Motion Picture Industry. At the present time Mr. Jones is a member of the Engineering Department of RCA Photophone and has been closely identified with the educational activities of that organization since the time of its inception. He is a graduate of the Milwaukee College of Engineering and was at one time Instructor of Mathematics and Electrical Design at that institution.—THE EDITOR.*

## Selecting Projection Lenses

**I**N the performance of his duties, the projectionist is often called upon to set up projection equipment. This, of course, includes the selection of the proper picture lenses for the particular theatre and equipment in question. This article has been prepared to aid the projectionist in the proper selection of such lenses, with particular emphasis being placed on the selection of lenses having the proper equivalent focal length in inches.

While it is true that the quality of a picture depends upon the quality of the lens selected, the light employed, and type of screen used, no comments will be made regarding either the light or the screen. Good quality projection lenses are made by several American manufacturers, and these manufacturers would be glad upon request to furnish any projectionist with specifications, data, price, or any other information desired regarding their lenses. It is not the purpose of this article to recommend a lens of particular manufacture. However, for the purpose of example a brief explanation of the lenses manufactured by Bausch and Lomb will be given.

The Cinephor lenses are well corrected for spherical and chromatic aberration. Series I lens has an outside diameter of  $2\frac{1}{32}$  inches (51.6 mm.) with a free aperture of  $1\frac{23}{32}$  inches (43.5 mm.) which is the greatest diameter that will work through the aperture opening on machines having the focusing mount attached to the front of the head. Series I Cinephors are listed in focal lengths, ranging in  $\frac{1}{4}$  inch steps from 3 to 7 inches, inclusive, and in  $\frac{1}{2}$  inch steps from 7 to 8 inches.

The series II lens has an outside lens diameter of  $2\frac{23}{32}$  inches (69.3 mm.) with a free aperture of  $2\frac{7}{16}$  inches (62 mm.) and are listed and stocked in focal lengths ranging in  $\frac{1}{4}$  inch steps from 5 to 8 inches and in  $\frac{1}{2}$  inch steps from 8 to 9 inches.

The series I lens will be found satisfactory for general motion picture

requirements under ordinary theatre conditions. The series II lens should be selected when conditions in the theatre as to projection distance and size of picture are such that longer focal lengths can be used because of increased illumination due to their larger aperture.

Bausch and Lomb claim for their New Super Cinephor Lenses remarkable covering power, more flatness of field, and more critical definition. Super Cinephors of focal lengths of  $3\frac{1}{2}$  inches or longer may be used in the projection of wide film. The increasing practice of projecting very much wider pictures from standard 35 mm. film (regardless of aperture shape) is rendered practical by the short focal length lenses, namely, from  $3\frac{1}{4}$  inches to 2 inches. The Super Cinephor lenses may be obtained in focal lengths ranging from 2 inches to  $5\frac{1}{2}$  inches.

When lenses are ordered the manufacturer should be given the make and model of the projection machine to be equipped so that the proper lens adapter will be supplied with the lens.

## Determining the Correct Focal Length

The accompanying family of lens curves will be found exceedingly convenient in determining the correct focal length of lens for use in any given theatre. From past experience every projectionist knows that the focal length of lens to be used depends upon the projection distance and the size of picture to be projected upon the screen.

If the projection distance or picture throw and size of screen are known, the focal length of lens can be found by using the family of lens curves as explained below. If, however, the projection distance is not known it would be rather difficult to measure since the projection distance is the distance from the projector to the center of the screen. When this is the case the projection distance can be calculated by first measuring the vertical distance from the projector lens center line straight down to a position corresponding to the height of the center of the screen; second, by measuring the horizontal distance from a position directly under the projectors to the screen. Next, calculate the sum of the squares of the vertical and horizontal distances, and then extract the square root of this value. This result will be the projection distance which will be used when using family of lens curves.

As an example in determining the projection distance, let us assume a vertical distance of 50 ft. from the

projector lens center-line to a position corresponding to the height of the center of the screen, and a horizontal distance of 100 feet from a position directly beneath the projector to the screen. Then  $50^2$  squared plus  $100^2$  squared equals 2500 plus 10000 or 12500. The projection distance or picture throw then equals the square root of 12500 or 111.8 feet.

In making use of the lens curves it should be observed that the vertical axis marked picture width in feet is based on a picture aperture width of 0.906 inches and height of 0.6795 inches which are the Standard aperture dimensions adopted by the Society of Motion Picture Engineers for full aperture or silent prints. If the curves are to be used with sound-on-film prints, the picture aperture width dimensions shown on the lens curve chart are to be reduced 11 percent. This is occasioned by the fact that all sound-on-film apertures are reduced in size. While a standard sound-on-film aperture has not been adopted the S. M. P. E. has recommended dimensions of 0.600 x 0.800 which values are those used on practically all recent or modern projection machines. It should be observed further that the ratio of picture height to picture width is 3 to 4, and that the height of the picture can be found by multiplying the picture width by 0.75.

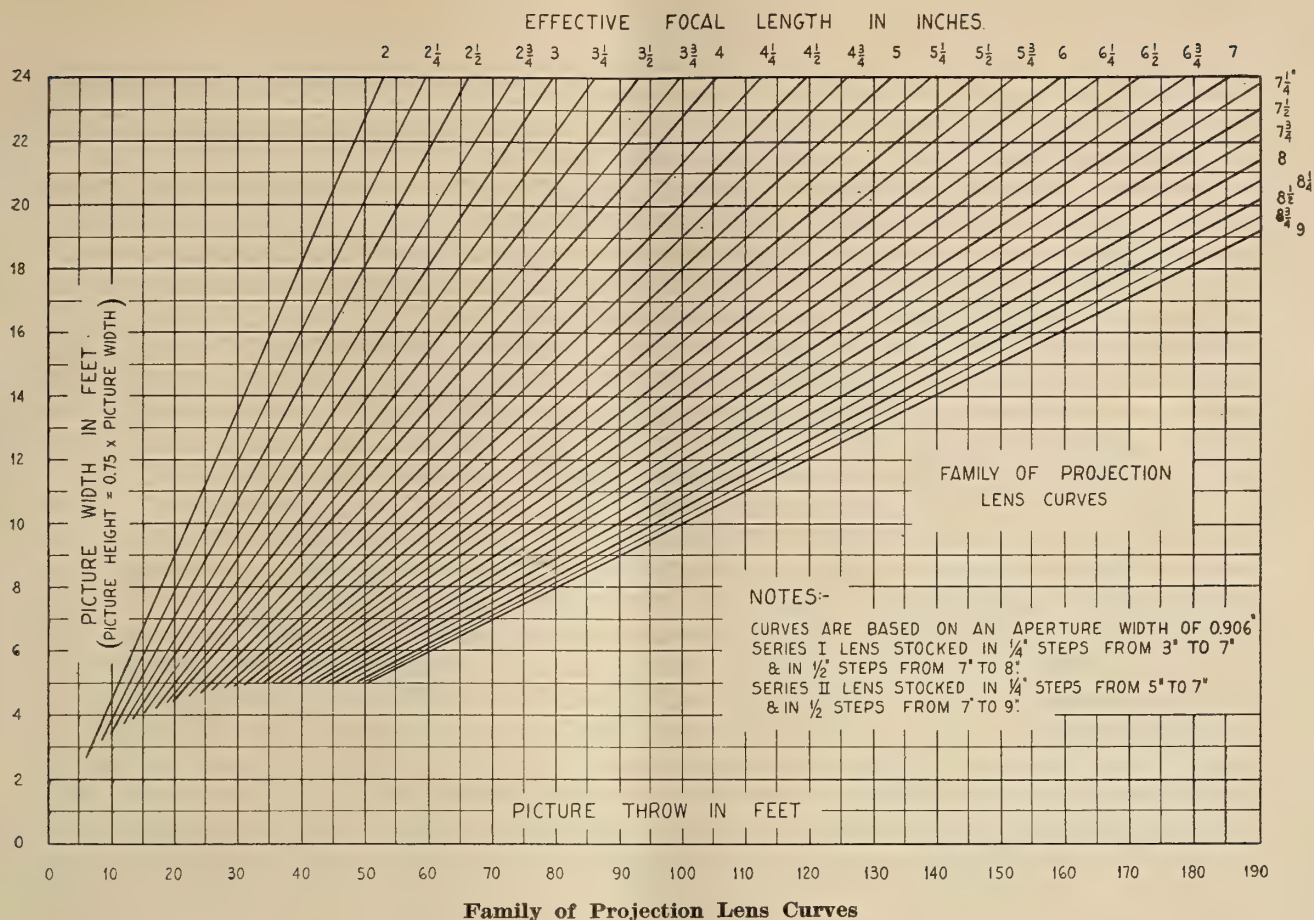
The horizontal axis of the lens curves is graduated to give the picture throw in feet. Each line in the family of lens curves is the curve for a particular focal length of lens. Also each line shows the relation for a particular focal length that exists between the picture width and picture throw.

## To Find Focal Length by Means of Curve

In making use of the family of lens curves to determine the correct focal length of lens to be used, let it be assumed that a picture width of 20 feet is desired with a picture throw of 111.8 feet as found in the above example. Draw a horizontal line through the curves at 20 feet for picture width, and draw a vertical line at 111.8 feet for picture throw. The lens curve line that lies nearest to the intersection of the above two lines will show the focal length to be used. In this case the nearest lens line is for a 5 inch focal length. Therefore, a 5 inch focal length lens is to be selected.

As another example in the use of the family of lens curves, let it be desired to find the size of picture when the focal length of the lens is known





and the projection distance or picture throw is known. The size of the lens is 4 inches and the picture throw is 80 feet. Draw a vertical line at 80 feet for picture throw. Where this line intersects the 4 inch focal length line, draw a horizontal line through the curves and read on the vertical axis the picture width in feet which in this case is 18 feet.

As a further example let it be desired to find the picture throw for a given theatre when the picture size and lens size are known. The picture width is 20 feet and the lens size is  $7\frac{1}{2}$  inches. Draw a horizontal line at 20 feet through the family of curves. Where this line intersects the  $7\frac{1}{2}$  inch focal length line, draw a vertical line and read the picture throw in feet on the horizontal axis which in the above case is 165 feet.

In using the family of curves it should be noted that for a given picture and lens size, the picture throw can be determined to the nearest foot. Also when the size of lens and throw are given the picture width can be determined within a fractional part of a foot. The above together with the flexibility and simplicity in the use of the lens curve is claimed as a great advantage and time saver when compared with the usual lens table.

#### Calculating Focal Length

For those projectionists who prefer to calculate the equivalent focal

length of lenses the following formula is given:

$$f = \frac{W \times L}{W + P}$$

W = aperture width in inches

P = width of picture in inches

L = picture throw in inches

f = equivalent focal length in inches

In applying the formula let the picture throw equal 100 feet (1200 inches) and a picture width of 11 feet 3 inches (135 inches). A standard aperture width of 0.906 inches is used.

$$f = \frac{0.906 \times 1200}{0.906 + 135} = 8 \text{ inches}$$

If it is desired to find the picture throw, given a lens size of 8 inches and picture width of 135 inches, the formula is:

$$L = \frac{f(W + P)}{W}$$

$$L = \frac{8(0.906 + 135)}{.906} = 1200 \text{ inches}$$

Where the picture width is desired use the following formula given a

picture throw 1200 inches and an 8 inch lens.

$$P = \frac{W(L - f)}{f}$$

$$P = \frac{0.906(1200 - 8)}{8} = 135 \text{ inches}$$

#### Photophone in India

Business in the motion picture theatres of India appears to be booming, if the constantly increasing number of installations of sound reproducing apparatus may be taken as a criterion. Within the past week Van Ness Philip, manager of the foreign department of RCA Photophone, Inc., has received orders for ten complete units of equipment from Madan Theatres, Ltd., and Alex Hague, authorized distributors for Photophone in Bombay, and to these most recent orders may be added seventy-four units which have been installed in theatres in various sections of India during the past eight months.

#### S. K. Wolf Becomes Fellow of A. S. A.

S. K. Wolf, Director of the Acoustic Consulting Service of Electrical Research Products, has been honored by election as a Fellow of the Acoustic Society of America. He has also been appointed a member of the Society's Standardization Committee.



## Motion Pictures and Eyestrain

VIEWING motion pictures entails less eyestrain than reading a book for a corresponding length of time, says Dr. Park Lewis, of Buffalo, N. Y., Vice-President of the National Society for the Prevention of Blindness. Discussing "The Cinema and the Eye," Dr. Lewis says:

"Under normal physiological conditions, moving pictures do not cause serious eye fatigue. Since viewing moving pictures is distant vision, it does not demand so great an ocular effort as near vision—such as reading for a corresponding length of time. When eyestrain is caused by moving pictures it is due to one or another preventable condition, such as too prolonged fixing of the attention on a single point, or defective visual function, to a bad position of the observer in relation to the screen, to poor films, improper manipulation of the apparatus, to faulty projection or to improper illumination. With these reservations there is no more harm to the eyes in viewing the moving pictures with modern improved methods than there is in any other normal use of the eyes.

"In a recent inquiry which was instituted by Professor De Feo of Italy and presented to the League of Nations, opinions were secured from leading eye physicians throughout the world. The agreement was general in the views expressed. There are four elements to be considered in an inquiry as to whether moving pictures can in any degree be injurious to the eyes of the observer. These have to do with the quality of the film, with the arrangement of the lighting and the mechanism of the motion, and with the position of the observer. The final and important requirement is that his own eyes shall function normally.

### Picture Must Be Clear

"The first requisite is that the screen picture shall be clear and distinct. The captions and other descriptive matter accompanying the view should be sufficiently large to be easily read and not so redundant that the reading may not be easily completed before it disappears.

That the film may be clearly shown depends on several elements. The first is the illumination. This should be adequate but not glaring. A glare is an excess of unfocused light; a sharp unshielded bundle of light rays coming from one side or the other or reflected from the screen itself, or from an unshaded light bulb in the dimness of the playhouse, will cause unnecessary discomfort.

"The arrangement of the scene itself so that glaring reflections are thrown back on the audience is now of infrequent occurrence, as the good

producers are employing the assistance of the best artistic and illuminating engineering talent. It is better that the hall in which the picture is shown be not too dark. Strong contrasts of light and darkness are not pleasant and the details of the picture are brought out with even greater clearness in a twilight atmosphere if there are no distracting light sources visible. It is imperative that the film be run through with just the right degree of rapidity to make the images stand out and to move with the deliberation of actual living people.

### Correct Speed Essential

"The beauty as well as the eye comfort of what might otherwise be an exquisite picture is often ruined by the rapidity with which it is shown. In the exhibition of an instructive picture recently shown in an educational institution of high standing a current of twenty-five instead of sixty cycles was used. This together with some fault in the motor mechanism caused a constant flickering of the light that gave the impression of a picture seen through falling water. The sensation produced was most uncomfortable and soon became fatiguing. The whole effect of the picture was thereby lost and the illusion destroyed.

"It is also important that films be retired from service after a reasonable amount of use. When they become spotted and cracked either from the heat of the lamp or from too long continued use, they give blurred and indistinct impressions and are neither attractive nor comfortable to look upon. In some of the cheaper picture houses they are used much too long.

### Observer's Position Important

"The position which the observer occupies in relation to the screen contributes very much to the eye comfort. If he is too close to the screen the pictures become blurred and confused, and defects are emphasized. The same effect is produced if the picture is viewed from too great an angle from one side or the other. Sometimes these nearer inferior seats are cheaper and are occupied by children whose eyes are more easily harmed by the resulting strain than would be the eyes of older people. Children should not be allowed to occupy these less desirable positions. The best place from which the picture can be viewed is near the center of the hall and directly in front of the screen.

### The Final Requirement

"The final requirement, if the film is to be seen without discomfort, is

that the eyes of the observer shall be functionally normal and of good visual acuity. When in the absence of any of the defects above mentioned—in the screen, in the evenness with which it is shown, in the illumination and in the position of the observer—there is still a consciousness of strain which is not occasional but persistent, it is safe to assume that there is present some ocular defect that should be corrected. It may be focal or muscular but it will be found that any other continuous use of the eyes will be equally discomfiting. In that event, the eyes should be examined in order that the defect may be found and corrected and the prescribed glasses worn."

## Strong Remote V. C. Accorded RCA Approval

The Essanay Electric Manufacturing Co. of Chicago has announced recently that the new Strong remote volume control, developed by Mr. Larry Strong, who has in addition a long list of projection equipment accessories to his credit, has received the approval of RCA Photophone for use with their equipment. This means that any exhibitor desiring the attachment of the new type volume control to his Photophone equipment, has the permission of the company to do so.

One of the devices has been installed recently at Proctor's Theatre in Yonkers, N. Y., and is reported to be giving excellent service.

The new volume control is unique in design and extremely simple in operation. The control itself mounts directly on the amplifier panel, the installation requiring only the time necessary to remove the regular volume control knob and its indicator panel, place the regular knob on the new control, drill three holes in the amplifier panel for mounting, slip the new control over the volume control shaft and mount the device by means of three screws. The control is then wired to the remote control buttons and connected to a 110 volt source.

### Simplicity of Operation

The pushbutton unit consists of two buttons, one marked "Up" and the other marked "Down." One push on the "Up" button causes the volume control to advance one point. One push on the "Down" button causes the volume control to retard one point. If more volume is desired the "Up" button is pressed once. If still more is desired the button is pressed again, the volume control contact advancing one point for every time the button is depressed. Reduction in volume is accomplished in the same manner, excepting that the "Down" button is used.



## New Equipment and Appliances

### Kliegl Develops Program Light for Earl Carroll Theatre

One of the many new features in evidence at the new Earl Carroll Theatre is a clever little device installed in the back of every orchestra seat—which conveniently provides local light by touching a button, so that patrons may read their programs at any time they wish to do so even though the house is in complete darkness.

It is called a program light, and was developed by Kliegl Brothers in collaboration with Earl Carroll. It is a neat and compact little arrangement which is fitted into the back of the chair without projections of any



kind to catch the clothes or bother the patrons passing in and out of their seats. Individual battery service is used for the lamps—which eliminates the necessity of expensive wiring. A light guard shields the light so that it only illuminates the program held directly below it, with just a sufficient amount of light to enable one to easily read his program—and causes no interference with black-out scenes or annoyance to patrons in adjoining seats.

It is especially useful in theatres where there is a long program, and there are a number of characters coming in on the stage during the progress of the performance, announced in the program in the order of their appearance. Patrons naturally want to know who they are and whom they characterize—and this program light enables them to glance at their program without the necessity of lighting matches, or using other dangerous and annoying methods of obtaining local illumination.

### New Oval Tubing and Oval BX Cable

The General Electric Company has announced two new additions to its line of wiring materials, oval tubing and oval BX cable.

Oval tubing is a thin-walled, rigid metal raceway designed for under-plaster extension installations in walls and ceilings. It is installed by cutting a groove in the plaster, inserting and fastening the tubing, and

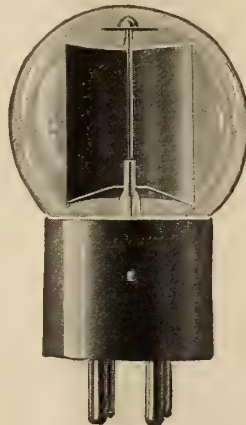
covering it with a layer of plaster. A specially-designed toggle with a loop securely holds the tubing in place, insuring a firm installation. It may be used in direct connection with rigid conduit by joining it to the conduit with one fitting. The tubing provides an ideal extension for an existing type of raceway, and may be interchanged with any other wiring system.

The oval BX cable incorporates all the features of BX cable plus one important feature, its oval shape, a factor which makes it particularly adaptable for all exposed or surface wiring. Neat installations are assured because the oval cable nestles into the plaster without the need for channeling the walls and ceilings, and fits snugly around corners and projections.

Both of these new wiring devices are particularly suited for partition installation.

### G-M Labs' New Photocell

A NEW size of Visitron photoelectric cell is announced by G-M Laboratories, Inc., Chicago, to meet the demand for a Visitron cell of medium size with a globular bulb. This new cell measures  $2\frac{13}{16}$  inches from the bottom of the bakelite base to the top of the bulb, the



The New P.E. Cell

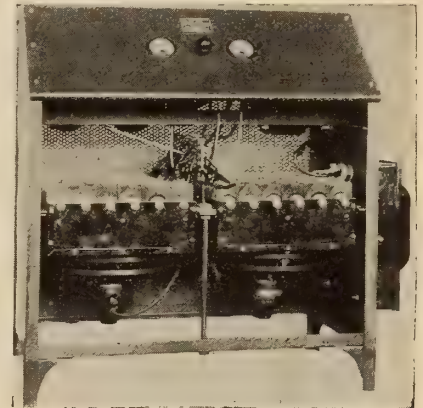
bulb itself being  $1\frac{15}{16}$  inches in diameter. Except in the matter of size, the Visitron 73-A is the same as other Visitron having the same high sensitivity and long life for which Visitrons are noted.

This new cell, added to the already large line of Visitron cells, makes Visitrons by far the most complete line of P. E. Cells manufactured by any one company. There is now a Visitron for every make of sound equipment of importance, and for all types of industrial and commercial applications.

### G. E. Introduces Copper Oxide Rectifier for M. P. Use

The first copper-oxide rectifier to be introduced for the motion picture field, built to improve the growing use of full vision screens, wider films and colored motion pictures has been announced by the General Electric Company.

The rapid strides made in the motion picture industry have required radical changes in theatre equipment. The so-called "low-intensity"



Copper Oxide Rectifier

projectors installed in most motion picture theatres are not entirely suitable for the present colored projection and greater screen areas. As a result, a rectifier of high intensity and capable of meeting these requirements was needed.

One of the outstanding features of the new rectifier is that it may be used either for a high-intensity projector or for one or two low-intensity projectors. Used with a high-intensity projector, it supplies 60 to 70 amperes of arc current. Operated with one or two low-intensity projectors, each of the two sections supplies 30 to 35 amperes.

The new rectifier makes use of the copper-oxide disc principle of rectification, which gives it durability, long life and freedom from maintenance expense. A system of forced ventilation, using radiating fins and two small electric blowers, forces a steady stream of cool air over the copper-oxide elements and maintains a temperature within ten degrees of the surrounding air temperature. Not until such a cooling system was perfected was it possible to develop a successful high-output rectifier.

No objectionable noise is made by the rectifier, which enables it to be placed in the projection room. Installation and operation of the unit are simple. One switch starts or stops the rectifier instantly, without the usual "starting" or "warming up."



# Patents:

*A series of instructive and interesting articles on how patents are obtained and sold.*

By RAY B. WHITMAN

NOTE: In this series of articles Mr. Ray B. Whitman, practicing patent attorney of New York City, explains in understandable non-technical language, just what a patent is, how one is secured and how it may be sold. In addition, Mr. Whitman offers to the readers of this magazine personal advice without obligation on any subject connected with patents, trademarks, designs, or copyrights. All inquiries should be addressed to Mr. Whitman in care of this magazine.—EDITOR.

## Completing and Filing Application

**W**HEN the specification, claims, and drawings have been completed to the satisfaction of both the attorney and the inventor, which last should check it over carefully to be sure it accurately covers his whole idea, the inventor then signs the petition and power of attorney, the specification, and finally the oath, which last recites essentially that he is the first inventor to the best of his knowledge and belief. This oath is sworn to before a Notary Public. The attorney then assembles the complete typewritten papers and mails them with the drawings and a check for \$20, to pay the government filing fee, to the "Commissioner of Patents, Washington, D. C." A few days later a receipt comes back giving the filing number and filing date of the application, and the number of the patent office division to which it has been assigned for examination. At the present time, there follows a delay of from three to five months before the case is taken up in its proper turn for examination. At the end of that time, the attorney gets what is known as an "office action."

## Prosecution of Application

Now the contest begins between the Patent Office and the attorney. The Examiner in Washington to whom the case is assigned has carefully studied the specification and drawings and particularly read the wording of the claims, and has made as thorough a search as possible, not only among United States prior patents, but among any patents or other publications throughout the world, to determine if the invention, as stated in each of the claims, has ever before been published. For the inventor is entitled to a patent only on a new invention, and if any part of it has been thought out by someone else, and disclosed, either in this country or abroad, in a patent, magazine, book or other publication, the inventor is then barred from receiving a patent as to that part, and those claims will be rejected.

The Examiner has, in his office, all those patents and like publications which apply to the inventor's conception. So, when the case has been assigned to that particular office or division, this field of search has been narrowed down very materially; for patents are now classified into over 300 classes, each with a large number of sub-classes. Every patent has one particular class and sub-class number to which it belongs. The task of the Examiner is then to search through a hundred patents, more or less, and compare the prior disclosures of those patents, and in some instances, of other publications as well, with that covered by the wording of the inventor's claims; and wherever such claims "read upon" or cover any such prior patent, to reject those claims on that patent, referring to it by number. Or he may reject a claim on a combination of two or more patents, whenever he thinks it would not involve the faculty of true invention, but merely the skill of an ordinary mechanic, to combine them as the inventor has done. Finally, he allows those claims which appear to be new and patentable. A copy of the Examiner's letter is sent to the attorney.

## Amending the Case

When the attorney receives the Examiner's action, he orders a copy of each reference cited by the Examiner; then he should notify the inventor, who should try to help him determine exactly wherein these prior patents, used in rejecting one or more of the claims, are or are not pertinent and proper references.

The attorney by himself is usually capable of preparing the amendment answering the Examiner's action, but the inventor often has an expert's knowledge of the invention, gleaned from a longer association with it. The attorney carefully studies the objections of the Examiner to each claim, considers the specific reasons for rejection, compares the references with the disclosure in the application, and so either cancels the claim, amends it by adding or removing a word or phrase until it no longer reads on the references; or he may disagree with the Examiner, citing legal decisions where necessary, to show that the latter is in error in his rejection. This action is repeated for each claim, until all have been cancelled, argued, or amended. Then perhaps some new claims are added, and with each one is a reason why it is believed to be patentable to the inventor over both the prior art and the other claims.

This paper, comprising the "amendment," is then mailed to the Commissioner.

## Continuing the Prosecution

In the light of the attorney's amendment, the Examiner then again considers the application in its regular turn, usually several months after receiving the amendment. He makes a study of the case anew, agrees or disagrees with the attorney's request for allowance of the case as amended, or only as to part of the claims, and then prepares a new action. He is permitted to cite new reference patents or other reasons for rejecting any claim, to reverse his position in the light of the attorney's arguments, or to effect some compromise.

This process may be repeated a number of times. The attorney continues to amend and improve the claims until satisfied he has obtained as many and as strong patent claims as his client is entitled to. By this time, he has cancelled the last of the claims objected to, or amended them to accord with the Examiner's views, or else convinced him that they are allowable.

The Examiner thereupon allows the application, and notifies the attorney. Thereafter, any time within six months, the final government fee of \$20 can be paid, after receipt of which the patent issues some three weeks later.

After the issue of the patent, which is a legal-looking document containing a copy of the amended specification, claims, and drawings, and tied together with ribbon and having the red seal of the government affixed, paper copies of it may be purchased by anyone by merely sending to the Commissioner of Patents, Washington, D. C., ten cents for each copy desired, giving always the number of the patent, and also, if possible, the date of issue, the name of the inventor, and its title.

## Patent Office Complications

The above is a brief description of the procedure through which the application goes until it becomes a patent, this description being limited to a simple case in which no complications arise. However, there are certain technicalities which may develop, and two of these will now be considered.

## Interferences

Since, according to law, a patent can be granted only to the first or prior inventor, it often happens that when the inventor's application is filed, there has already been filed in Washington an application on a similar invention, in whole or in part, by another inventor. Or maybe such an application is filed after the inventor has filed his, but during its prosecution or within two years after it issues. In any of these cases an "interference" may be started either by



the Patent Office Examiner or on the request of either inventor or their attorneys.

This interference proceeding is merely a contest between two or more claimants for the same invention to determine which of them is the prior inventor and therefore entitled to the patent. The one who conceives the idea first, providing he exercises due diligence in its disclosure and reduction to practice, is held to be the prior inventor and so entitled to the patent over the other claimant or claimants.

An interference proceeding is a very complicated and highly technical one, and calls for the best skill of attorneys experienced in that particular kind of a contest. It involves the taking of depositions, the preparation of exhibits to offer in evidence, and the examination of witnesses under oath to prove the inventor's dates of conception disclosure to others, and reduction to practice. (And as regards this "reduction to practice," it should be noted that the filing of the application is considered to be a *constructive* reduction to practice, requiring no further proof—hence the desirability of little or no delay in the filing of patent applications.) Then, depending upon what evidence has been deduced during the proceeding, arguments are advanced, and supported often by prior decisions, to determine which of the claimants is entitled to the claims in dispute. Some times certain of these claims are awarded to one claimant and the remainder to one or more of the others. The case is then finished, and those claims appear in the respective applications, and the disallowed ones are cancelled.

An appeal may be taken from the decision of the Interference Examiner to the Board of Examiners-in-Chief, and finally to the Court of Appeals of the District of Columbia, which is here the court of last resort.

A study of statistics reveals that about one application in forty gets into an interference. When an application does become so involved, although this means considerably more expense for the inventor, he should remember that the chance of his making money out of his patent is usually correspondingly greater, since he then has one or more competitors so anxious to get a valid patent on the invention that they might well be induced to buy him out, rather than have to continue the expense and uncertainty of the interference proceeding. And this often happens, usually to the financial advantage of the inventor.

#### Division

The requirement of "division" may be made by the Examiner in the Patent Office at any time during the pendency of the patent application;

but it is usually made with the first office action. It indicates that, in the belief of the Examiner, the patent application covers two or more independent inventions, differing so much from each other as to be examinable in different divisions, or classifiable in different classes or sub-classes. Therefore, since each patent may cover but one independent invention, only claims to that one can be retained.

The subject of division is quite technical, and there is considerable law regarding it. So, instead of meekly agreeing with the Examiner, and cancelling the alleged divisible claims, the attorney should know the law well enough to judge if the division requirement is proper, and if in any doubt—and there is proper doubt in many such requirements—he should in his next amendment champion the cause of his client by arguing the impropriety of such action, and asking for reconsideration, and an opinion by the Classification Examiner.

Often a sound argument, strenuously put, showing why it is believed all the claims in the application are directed to cover but a single invention which belongs to but one class and is properly examinable in but one division, will suffice to have the requirement withdrawn. Where the attorney can accomplish this, he saves his client the loss of valuable rights through the cancellation of certain claims, or the expense of filing an additional or divisional case or cases.

#### Keeping the Application Pending

While of course circumstances alter cases, it is usually wise not to allow a patent application to issue into a patent immediately, but rather to keep it pending as long as possible, and until the time that the patent is really needed, as, for instance, in the event of a known infringement of the allowed claims and the desire to take immediate action on such infringement. Of course, in following out this plan, it must be remembered that the inventor has no right to sue for infringement until after the patent has issued, and he cannot collect profits and damages for any infringement before the date of issue of the patent.

The common practice of many large corporations, as well as of experienced and successful inventors is to prepare and file the patent application as soon as possible after the inventor's conception of the idea, and then to quite vigorously "prosecute" the case, through the prompt filing of amendments in answer to each office action, until an appreciable amount of the total protection in claims belonging to the inventor has been granted by the Examiner. Thereafter, on receipt of each Patent Office action, nearly all of the six months,

now allowed by law, is permitted to elapse before an amendment answering the action is filed. In this and other ways, the case may be delayed and the application held pending in the Patent Office for a number of years; but after a total of some three years, the office may request a prompt conclusion to the prosecution so as to get the patent issued.

(To be continued)

#### QUESTIONS AND ANSWERS

Q. 1—When should a design patent be taken out and when should a mechanical or ordinary patent be taken out? In other words, what is the difference between these two kinds of patents?

A. 1—A design patent is directed to an invention in which the form or appearance of the invention is important from an aesthetic or ornamental viewpoint whereas a mechanical or ordinary type of patent is directed to the function of the invention. Whenever possible take out a mechanical patent for it is less easily avoided without infringement and therefore gives much better protection, and better prevents competition. A design patent may often be avoided by more or less simple changes in the appearance of the design without affecting the value of the new appearance.

Q. 2—Will the Patent Office issue a patent on the same thing to more than one inventor?

A. 2—No. The Patent Office can only issue a patent to the first inventor, although it sometimes happens that later inventors also get patents on somewhat similar things which may be modifications of or improvements over something previously patented. It is necessary for a patentee before utilizing his invention to determine by an infringement search whether there is any such other patents previously issued on part of his invention and which he would have to use in order to also use his own invention; for in that case he might infringe the claims of such prior patents and be estopped from the use of his own patent as a result.

Q. 3—Is it possible for a poor man to make money out of a patent?

A. 3—It certainly is. Some of the greatest fortunes have been built up by men who were originally poor and who make valuable inventions and obtained strong patents on them. Large corporations fear to be drawn into infringement suits over patents and will do all they can to avoid infringing. Where, however, there is an infringement and the owner of the patent has no funds to sue the infringer, he can often make an arrangement with the Patent Attorney to conduct the litigation on a contingent fee basis.



# VISIBESTONE

THE PERFECT FIREPROOF SOUND SCREEN

## Makes EVERY Seat a Good One

### FEATURES

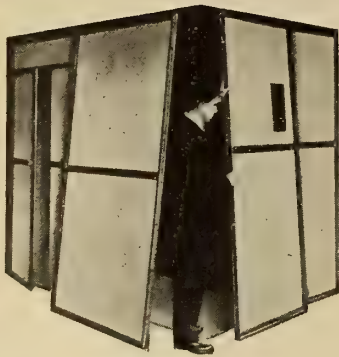
1. Fireproof
2. Free from distortion of sight or sound
3. Acoustically perfected
4. Eliminates "sound pockets"
5. No glare—restful to the eyes
6. Easy to clean—lasts longer

Perfect projection is that which affords an undistorted view of the projected picture from every angle of vision—side seats and down in front—and a clarity of sound from any seat in the house. Visibestone corrects distortion and affords maximum clarity of both vision and sound.

*Approved by E. R. P. I.*

*Distributed by National Theatre Supply Company  
Branches. Ask them for details or apply to the  
manufacturer*

**KEASBEY & MATTISON COMPANY**  
AMBLER, PA.



Both portable and permanent type

### STANDARD SIZES

4 ft. x 6 ft. x 7 ft. 1½ in. high  
6 ft. x 8 ft. x 7 ft. 1½ in. high  
8 ft. x 9 ft. x 7 ft. 1½ in. high  
9 ft. x 12 ft. x 7 ft. 1½ in. high  
9 ft. x 14 ft. x 7 ft. 1½ in. high

## PORTABLE AND PERMANENT FIRE-PROOF PROJECTION ROOMS

THESE booths are made of ¼" thick transite with angle iron 1¼" x 1¼" x 3/16". The panels are interchangeable and bolted together with stove bolts. The seams are filled with transite cement. The floor sheets are ⅝" thick asbestos. The Underwriters throughout the country have approved these booths, as well as the fire and building departments of all cities. Special booths built to conform with the Rules and Regulations of the Steamship Inspection Service on United States Shipping Lines.

## BLUE SEAL PRODUCTS COMPANY, Inc.

Distributor for Johns-Mansville Asbestos Products. Also  
Manufacturer of Motion Picture Accessories since 1913

WRITE FOR CATALOG OF BLUE SEAL PRODUCTS

262 Wyckoff Street

Brooklyn, N. Y.

## Some Aspects of Loudspeaker Development

*(Continued from page 24)*

phragm driving at points removed from the center.

Burstyne of Berlin, Germany, employed a series of reeds built into a "spider" to drive a diaphragm from points located on a circle described about the center of the diaphragm. Burstyne also used a magnetic force centrally located about the center of

the diaphragm. This had also been done by Eichmeyer as early as 1878.

In 1915, Edison employed the "hol-low boss" of Norcross to drive a diaphragm with a dish shaped stiffened central portion and the flexible peripheral portion.

Hanna in 1925, claimed as an invention, "as an article of manufacture, a diaphragm comprising a substantial conical base portion and a re-entrant apex portion, and having a coil secured thereto along the edge defined by said re-entrant portion."

Diaphragms have been made of practically all known materials, wood, glass, rubber, aluminum, copper, paper, iron, brass, tin, gold, silver, celluloid, etc. In addition to straight materials, many compositions have been employed. In making large diaphragms of ample stiffness and strength, Duncan employed "light muslin two to six ounces per yard heavily concocted and impregnated with suitable bakelite or condensite varnish compositions and dried and also preferably slightly cured in the drying process so as to minimize undistortable melting or flowing of the phenolic condensation cementing material under the pressure heat curing treatment." Several layers of such impregnated fabric were used in forming diaphragms ten to twenty inches in diameter.

### Various Other Diaphragms

Elman in 1924, claimed "the method of making a diaphragm which comprises severing the diaphragm from a sheet of magnetic material, heating said diaphragm to a temperature of the order of a thousand degrees centigrade and slowly cooling it. Also a vibrating diaphragm composed of approximately 55% iron and 45% nickel." This diaphragm of course is made for use with a magnetic motor.

Inglis in 1925 patented a diaphragm which had for its purpose elimination of the effects of temperature changes, the elimination or at least the minimization of the resonance effects and the elimination of acoustic shock. It consisted of a non-magnetic dish shaped diaphragm, the central and peripheral portions of which were flat and the portion intermediate the flat central portion and the flat peripheral central portion being dished. To the flat central portion, there is attached a piece of permalloy which has a higher initial permeability than iron and a lower value of magnetization at saturation.

In 1927, Leslie Stevens patented a method of making a "seamless diaphragm made from a continuous piece of one or more layers of plies, usually two of woven fabric impregnated with stiffening material and stretched and deformed without faults or laps to the desired shape, while the stiffening material is moist and held stretched in the shape to which it has been deformed until the stiffening material has become set."

In the Edison diaphragm of 1915, Mr. Edison stated "I now propose to form the flexible ring principle of the diaphragm of a acetyle cellulose or nitro-cellulose or cellulose-anthate (viscose cellulose), paper and light material, whose porous structure permits of large flexing with very little power, a property absent in metals, glass and similar non-porous metals."

While working on mechanical telephones, Horace K. Farrington and Holmer C. Farrington, in 1883 in-



vented a diaphragm of great interest since it foreshadowed or suggested if it did not actually anticipate, several inventions of later date. This diaphragm is shown in Figure 6. It will be noted that this invention employed two diaphragms B<sup>1</sup> and B. Work on the double diaphragm was done by Tigerstedt in 1923, and by Whittemore and Hoch in 1925. Spaces D and E are closed in order to permit air damping, a principle of great value to the skilled designer in loud speaker, telephone and microphone design. It will be noted that these early diaphragms were dish shaped and that the central portions though flat were stiffened with washers. Huston also used a dish shaped diaphragm in 1882 in making a mechanical telephone, while Thompson employed a flexible periphery of soft material in 1891.

In 1878 Eichmeyer employed stretched diaphragms, a principle now taken advantage of in microphone design, diaphragms elongated in shape and diaphragms driven from points removed from the center.

#### Human Ear Studied

It has not been uncommon for investigators to study the human ear and pattern their inventions after principles suggested from such a study. In taking out a patent in 1917, Miller wrote, "My invention bears a close relationship to the organic mechanism of the human ear, although the organic mechanism of the human ear operates to translate sound vibrations into a nerve transferable train of variations capable of perception by the human brain. I believe that this natural organic mechanism forms the best suggestive exemplification of mechanism capable of operating in the reverse order, that is, from a train of energy variations such as electric variations to sound waves. My anatomical studies and my development of vocal art science have taught me that there must be a coordination between the kinds of sound commonly produced by the human species and the shape of the tympanum primarily conveys the disturbance of sound waves to the re-

maining mechanism of the ear.

"The tympanum or the human ear diaphragm is not a disk-shaped diaphragm like the metallic diaphragm common in telephone receivers. On the contrary, it is very materially dished and the dishing is eccentric, the apex of the dished configuration being called the umbo. I have discovered that the resonating cavities of the human voice anatomy bear the proportion one to the other of 3:4:5. These cavities are respectively the laryngeal cavity, the nasal cavities and the mouth cavity. It also appears that the human tympanum has likewise three vibratory zones in different major planes but merging into the



## for BETTER SOUND REPRODUCTION

Projectionists are banishing their sound troubles with Visitron Photoelectric Cells. Their greater current output because of higher sensitivity assures perfect reproduction and freedom from trouble. Order by the name "VISITRON" — from your National Branch.



**GM LABORATORIES INC.**  
1733 BELMONT AVE. CHICAGO, ILL.

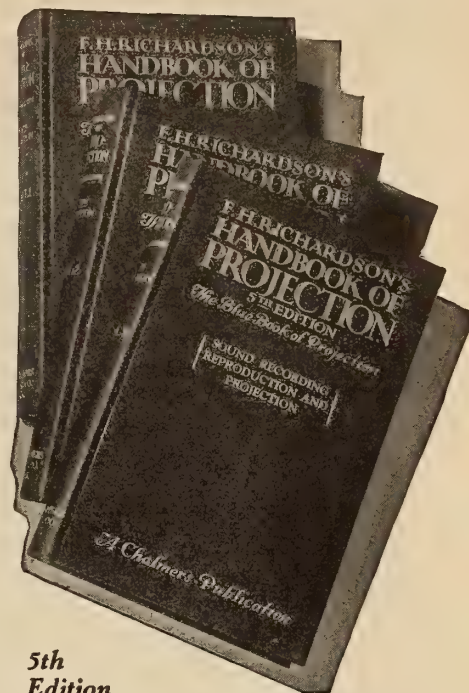
## Deal with SPECIALISTS

Get our interesting prices "On Your Projection Needs" as advertised in this publication before placing your order.

**AMUSEMENT  
SUPPLY CO. INC.**

630 Ninth Avenue, New York City

## THE BEST SELLER



5th  
Edition

### HANDBOOK OF PROJECTION

By F. H. Richardson

Back in 1910 Mr. Richardson wrote the first Handbook of Projection. It was a sell out. Second, third and fourth editions, each bigger and more successful have followed. The present fifth edition in three separate volumes, illustrated above, is the culmination of years of intensive effort.

Richardson is no swivel chair author. He knows the problems of the field—meets the men on their own ground. His books reflect a practical knowledge of just what information is needed. Recently he completed a 17,000 mile trip through the U. S. and Canada in the interests of projection.

#### CONTENTS

Volumes I and II are devoted entirely to the general subject of projection and everything related to it. Volume III deals exclusively with sound projection. All three volumes are profusely illustrated and contain over 1,400 pages of projection information written so you can understand it clearly. Each volume contains Richardson's famous question and answer index giving immediate access to hundreds of different problems.

These are the books which are being used by projectionists and theatre managers all over the world to secure improved results. Send for this finest of projection libraries today.

#### USE COUPON TO ORDER

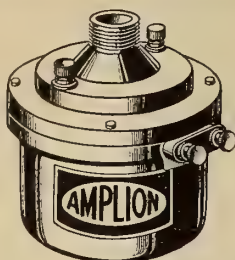
CHALMERS PUB. CO. (M)  
516 Fifth Avenue, New York, N. Y.

Enclosed find (check) (money order) for \$10.25. Send Richardson's 3 volume Handbook of Projection to.....

WINNIPEG, CANADA

J. M. RICE & CO., J. M. Rice, Prop. Leading equipment dealers in all kinds of projection room equipment facilities. Representatives of leading equipment manufacturers of the United States and Canada. All our merchandise guaranteed for performance and stability. Whatever you want we will supply it.





**True Dependability in Sound  
Equipment  
A New AMPLION Unit  
The Octophase  
Greater Efficiency  
Greater Range  
Greater Volume**

Music is reproduced in its full range and speech is reproduced with a finesse that retains every shade of human emotion.

*Write at once for full interesting details*

**AMPLION PRODUCTS CORP.**

38 West 21st Street

New York

**MR. PROJECTIONIST:**

Good projection is up to you. Insist that the screen is kept in first class condition. You know the best equipment is useless if the screen is old or dirty.

After all, good Projection is only as good as your Screen . . . Our Screens "clinch" good projection.

*A Screen for Every Type of House*

**Chromolite**  
Sound Screen  
Non-Glare • Diffusive

The Hallmark of Quality  
and Service

**Vocalite**  
Sound Screen  
CRYSTAL BEADED

**BEADED SCREEN CORP., Roosevelt, N. Y.**

Write for Samples and "Getting the Light You Pay For"

**SOUND REELS**

For Perfect Projection

**ALL-WELDED TYPE**  
One Unit

**LASTING DURABILITY**  
Bright Cadmium Plated

**UNIVERSAL ELECTRIC**  
9-16 Thirty-seventh Ave.,



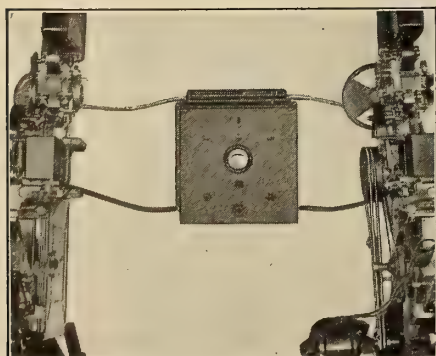
—All Sizes—

**DEMOUNTABLE TYPE**  
Each side one unit

**ALL PARTS  
REPLACEABLE**

Write for quotations

**WELDING COMPANY**  
Long Island City, N. Y.



**MELLAPHONE**  
All-Electric Theatre Amplifier  
Two Mellaphone Sound Heads, one Mellaphone  
All-Electric Theatre Amplifier and Stage Speakers  
complete Sound Installation.

Eliminates "A" and "B" batteries, charging and amplifying equipment. Complete control of power supply for exciter lamp and photo electric cells. Complete amplification control. Perfect filter, no hum. Tone improved. A compact unit 15½" sq. 13" deep. 110 or 220 volt. 50-60 cycle.

Write or wire for full information

**MELLAPHONE CORP.**  
ROCHESTER, N. Y.

other, which roughly approximate the same proportion of 3:4:5. The human tympanum is so small that it is difficult by measurement to prove this 3:4:5 configuration, but it is probably true.

"An object of my invention is to form and combine means for artificially coordinating sound vibrations and electric variations in a manner analogously following the organic mechanism of the human ear and including a sound functioning diaphragm which is eccentrically dished in a manner approximating the human tympanum, and electro-magnetic means to function with the said diaphragm."

*(To be continued)*

**Selection of Screens**

*(Continued from page 22)*

great extent the location of the screen. In general, it may be said that the illusion of realism is best maintained by placing the screen either as close to the floor as possible or not more than 18 inches above it.

When possible, the floor of the stage on the house side of the screen should be covered or painted with a dark non-glossy material, as the stage floor produces annoying reflections of the picture.

The screen should, of course, have a mask around it to properly frame the picture, and to reduce the "jumping" effect which occurs when poor film or poor equipment is used. This mask is usually a black cloth free from gloss, but at various times a less absorptive material has been advocated to reduce the sharp contrast between the frame and the picture. Because of jumping, it is not desirable to use a light material next to the screen; the desired effect may be accomplished by a graded surface, with the darkest material adjacent the screen.

**Tilting of Screens**

Sometimes screens are tilted in order to correct for keystoneing, or, with silver screens, to redirect the light to better advantage. This is a difficult problem, and furthermore, it might be stated that a tilted screen collects more dirt than an upright screen. Tilting should be restricted to silver screens.

Keystoneing and side-view distortion are due to large projection angles or poor perspective, and cannot be corrected by using a modified aperture plate. Side-view distortion cannot be corrected, but can be avoided to a certain extent by keeping the screen as far from the front seats as possible, and by eliminating the wide front seats.

**House Lighting**

The principles of correct lighting for theatres are so well known that only a few of them will be mentioned here:

(a) The intensity of illumination should gradually diminish from the



street to the auditorium, so that the eyes may gradually become accommodated to the low intensities.

(b) Auditorium lighting should be of low intensity. The auditorium should be only sufficiently bright to permit patrons to readily locate empty seats, and not so bright that they will be distracted by movements of other people. Less light is needed in the front of the auditorium.

(c) All light sources should be diffused so that no points of considerable brightness are apparent, and no lights should be near the line of vision when viewing the picture.

(d) The light should be so deflected that as little as possible falls on the screen.

#### Installation

The manner of installing screens has an important bearing on the results obtained with them and the

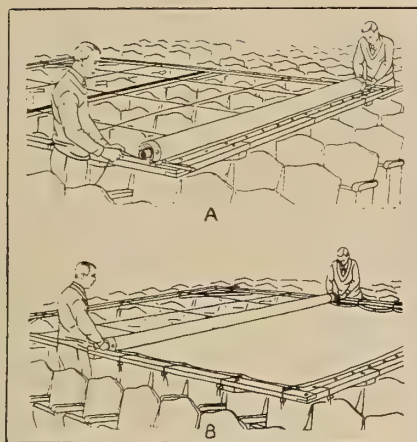


Fig. 6

economies effected. A few rules for installing screens will therefore be given. However, when manufacturers' instructions are available, they should be followed to the letter.

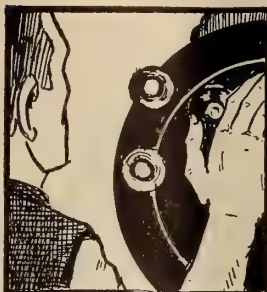
(1) Whenever possible, and wherever a screen is smaller than 15 by 20 feet, the screen can best be installed by assembling the frame on the stage or on the seats (Fig. 6), with the top toward the place the screen is to be.

(a) Lace the left side, which is the top screen surface, on the roll. Follow with the top and bottom of the screen, and then the right-hand side.

(b) When the screen is in place, tighten the laces; in the case of a beaded screen, where there is no need for extreme tightness, do not stretch other than to remove the wrinkles.

(2) If the frame is already in an upright position, a line should be fastened to the shipping roller and the screen should be raised into place on the left side of the frame, rested on the bottom rail, and fastened by the line to the top rail. Care should be taken not to crush the screen or allow the material to sag from the roller.

(a) With small pieces of line,



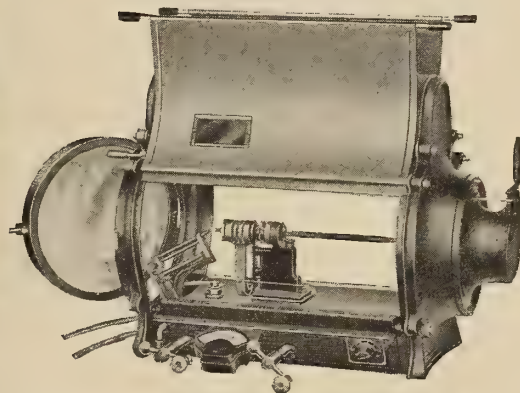
## THERE'S NO SCREEN TOO LARGE FOR A STRONG LAMP

# LIGHT



**STRONG  
HIGH INTENSITY  
AUTOMATIC  
REFLECTOR  
ARC LAMPS**

*Mechanical Simplicity  
Accuracy—Reliability*

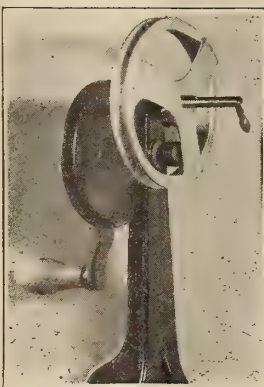


*For sale by Independent supply dealers*

**The Strong Electric Corporation**

2501 Lagrange St., Toledo, Ohio

Export Offices: 44 Whitehall St., New York, N. Y.



*Complete your booth equipment with a*

**"BEST"  
REWIND PULLEY**

*Takes the place of space collar on reel  
shaft—Crank is not removed.*

**Price \$2.50 at your dealer**

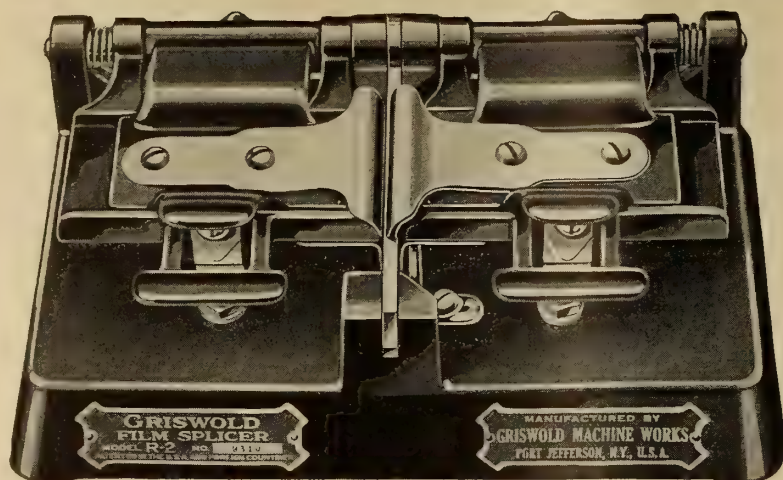
*Manufactured by*

**BEST DEVICES CO.**

2108 Payne Avenue,

Cleveland, O.





*Known  
and used the  
World Around*

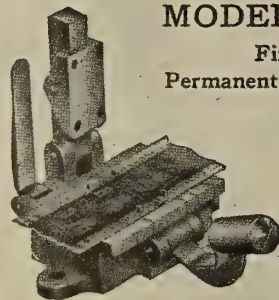
**M**ORE than 15,000 Griswold Film Splicers are in constant daily use throughout the world. For years the perfect splice has been made with a Griswold. Griswold is the standard film splicer for efficiency, durability and economy.

**GRISWOLD MACHINE WORKS**

Port Jefferson, L. I.

New York

## Universal Film Splicing Machine



MODEL NO. 3

Pat. March 22:22

First-Class Results on New or Old Film  
Permanent Gauge

No Adjusting

FOR THEATRES, EXCHANGES  
LABORATORIES, SCHOOLS

**Price \$6.00**

**GENERAL MACHINE CO., INC.**  
816-826 East 140th St., NEW YORK, N. Y.

For sale by all Supply Dealers

starting at the corner grommet, tie the screen into place at the top grommet, unrolling the screen as each grommet is tied to the frame.

(b) Lace the top of the screen after it is temporarily in position; then lace the bottom, and finally the sides.

(c) When the lacing is finished, tighten it gradually to free it of excess wrinkles. Do not stretch tightly.

### Maintenance

There are four phases to the maintenance of screens; one pertains to the preventing of dirt from accumulating on the screen; another to freeing it of excess dirt; the third to a complete and thorough cleaning of the screen; and the fourth to the renewing of the surface. The final objective is to keep the screen surface as nearly perfect as possible at all times by taking all precautions and by systematically attending to it.

### Surfaces

The surfaces of sound screens have very dissimilar characteristics. Some are very rough, some smooth, some hard, and some are sticky. The perforations add much to their ability to collect dirt, and porosity of the surface adds to a somewhat lesser degree. The circulation of air through the openings also makes it easier for the screen to collect dirt. Silver screens collect dirt, just as do the beaded and white screens; furthermore, they become tarnished, resulting in a lowered reflection value. A hard white screen is better than a sticky one from the maintenance standpoint.

### Accumulation of Dirt

The amount of dirt deposited on the surfaces of the screen depends on the atmosphere of the house, on the neighborhood, on the circulation of air in the theatre, and on the precautions taken to protect the screen. The first step to be taken toward keeping the surface clean is to determine whence the dirt comes, and to alleviate the difficulty at its source. The following are the more obvious sources of dirt; and remedies:

(1) Dirt falling from overhead and draperies. Thoroughly clean overhead, side draperies, and masking. Prevent travelers from brushing the screen.

(2) Stirring up of dirt by cleaners. Cover the screen at night when not in use, even though with only the cheapest kind of material.

(3) Circulation of air through the screen. Close doors, etc., which cause drafts, and back the screen, close to the horns, with a neutral gray material to prevent air from circulating through the openings.

### Brushing

Even after taking all these precautions, the screen will collect dirt. Inspection will indicate whether the dirt is dry or greasy and, therefore,

**KEEP all your COPIES of  
MOTION PICTURE PROJECTIONIST  
AS A REFERENCE FOR CURRENT  
AND FUTURE NEEDS—PRE-  
SERVE THEM IN A  
BINDER**

**\$2<sup>00</sup>**  
**each**

GOOD SOLID  
IMITATION LEATHER  
—GET ONE

ORDER FROM THE MOTION  
PICTURE PROJECTIONIST



whether the screen can be brushed. If the dirt is dry, the screen should be brushed with a long-handled special screen brush. It is also well to vacuum-clean the back of the screen once a week. The brush should be kept clean.

No satisfactory method of cleaning screens has been suggested as yet. It is possible to clean small samples of screen material, but the cleaning of screens installed in the theatre or when returned to the factory is not practicable. The screen sags, and water soaks in at the perforations, causing deterioration of the surface. Streaks result from unequal drying. The soap causes the screen to become yellow after a few days. If screens must be cleaned, however, there are certain instructions which, if followed, will produce better results than are usually obtained:

- (1) Great care must be taken;
- (2) Use two buckets, one for the cleaning solution and the other for clean water;
- (3) Keep the water and solution clean at all times;
- (4) Free the surroundings and screen of excess dirt before cleaning; vacuum preferably;
- (5) Use soft sponges and keep them dry, so that no water will run down the screen;
- (6) Work from the bottom to the top of the screen;
- (7) Use plenty of light.

#### Reprocessing

Replacing the surface of diffusing screens by spraying is receiving considerable attention. When carefully done, and when the proper material is used, a satisfactory job may be possible. The material should have a high reflection value, and should become yellow as little as possible. Here again, the screen and its surroundings should first be cleaned thoroughly.

In conclusion, in order to properly select, purchase, install, and maintain a screen, the following outline should be carefully followed:

- (1) Decide on the proper type of screen for the house.
  - (a) If the projection angle is less than 20 degrees and the house is not extremely wide, use a beaded screen.
  - (b) If the projection angle is greater than 20 degrees or the house is extremely wide, use a matte screen.
- (2) Choose the best screen surface of this type.
- (3) Analyze the house conditions and select the proper size of screen.
- (4) Install the screen properly, following the manufacturers' instructions.
- (5) Permit no circulation of air through the screen.
- (6) Cover the screen when not in use.
- (7) Brush the screen regularly once a week, with the proper kind of brush.

ask the fellow who uses one!  
 . . . . . he'll tell you

## HOFFMANN-SOONS RHEOSTATS *are perfect!!*



Every PERFECTION RHEOSTAT has satisfied its owner. Breakdowns, service-calls and trouble are unknown to *Perfection* users.

THE ONLY UNION MADE RHEOSTAT  
 Recognized as the Highest Standard everywhere.

Now equipped with solderless, adjustable lugs to take wire sizes from No. 4 to 4/0 without any additional cost.

We build rheostats for special requirements. Communicate with us Direct. There is no obligation.

Sold by all Branches of National Theatre Supply Co., Sam Kaplan, New York, Continental Theatre Accessories, and by your dealer.

## HOFFMANN-SOONS

*Electrical and Engineering Corporation*

387 FIRST AVENUE, NEW YORK

*Contracting Electrical Engineers—Moving Picture Theatre  
 Electrical Specialists*



## Radiovisor Acoustic Bridge

*Guaranteed Unconditionally for  
 ONE YEAR*

Radiovisor offers a Low Resistance, Highly Sensitive and Constant Acoustic Cell in which microphonics and background noises are reduced to a negligible factor. The Ruggedness, Simplicity of Construction, Greater Output and Longer Life of the Radiovisor Cell, ideally suits it for BETTER SOUND REPRODUCTION.

*Technical Data furnished on request*

RADIOVISOR FOREIGN and COLONIAL, Ltd.

202 EAST 44TH STREET

NEW YORK CITY, N. Y.





**IT'S SMART  
says:— SHOWMANSHIP  
TO BE THRIFTY!**

**BRAND NEW EQUIPMENT  
BARGAINS**

Rear Shutters for Simplex, \$98.75; Powers, \$139.50; Automatic Reflector Arc Lamps, \$139.90; Carbons, 25% Discount; Automatic Changeovers, per set, \$39.85; Photocells, all types, each \$12.95; Sound Absorbent Theatre Carpet, 69½¢ per yd.; Acoustical Felt, 27½¢ sq. yd.; Da-Tone Sound Screens, 39¢ sq. ft.; Silver Sound Screens, 54¢ sq. ft.; Beaded Sound Screens, 59¢ sq. ft.

**USED AND RECONDITIONED  
VALUES:**

Guaranteed Rebuilt Simplex Projectors, \$249.75; Rebuilt Powers 6A, \$95.00; Reflex Mazda Lamphouses, \$49.75; Choice of 5,000 Upholstered Chairs, \$1.00 up; Double Turntable Non-Sync Outfits, \$35.00; Automatic Reflector Arcs, \$69.75; Powers Mechanisms, \$10.00; Hall & Connolly Hy-Lo Arc Lamps, \$97.50; Syn-croverter 25/25 Motor Generators with Panel, \$125.00. Write for list. We buy or trade anything—WHAT HAVE YOU?

**SOUND-ON-FILM SYSTEMS \$395.00 COMPLETE:**

Startling Value Through Tremendous Volume—Read These Specifications: No Batteries, Generators, or Rectifiers. Our combination AC Operadio Power Unit furnishes Photocell and Exciter Lamp voltages. Complete equipment includes 2 Sound-on-Film Heads with Photocells; Licensed Optical Systems; Exciter Lamps, Lamphouse Brackets; Motor Brackets; All Drive Attachments; Combination Main Power Amplifier, Head Amplifier, A and B Battery Eliminators, Sound-On-Film Fader, all in one unit; Dynamic Speaker and Monitor; All Wiring Instructions. Total Cost \$395.00. Sound Heads less Amplifiers and Speakers, \$247.50 pair complete.

**PORTABLE SOUND-ON-FILM—ALL AC OPERATED \$796.60**

No Batteries, Generators or Rectifiers. Plug in any convenient light socket set up in five minutes, ready to operate. Equipment includes Projection Machine, Sound Film Head, Combination Power Unit and Amplifier, All Tubes, and Speaker. Uses 35 mm. Film. Finest reproduction suitable for audiences up to 2,000. 92' throw—9 x 12 picture. Write for particulars.

WRITE US YOUR NEEDS—ALL INQUIRIES ANSWERED PROMPTLY

**SERVICE - ON - SOUND CORPORATION**

Dept. MP Suites 607-609, 1600 Broadway, New York City

Cable Address—SOSOUND, New York



**SYNCRIFILM MODEL  
J SOUND EQUIPMENT**

Weber Machine Corp. was first to recognize the needs of the small theatre for a first class sound equipment equal to the best, but at a price in keeping with its abilities to buy and still keep reasonably on the black side of the ledger.

Weber Synchrofilm quality has been recognized from the very beginning. It is among the leading sound equipments, yet is sold at a low price and absolutely free of all extra charges, such as service, fees etc.,

Model "J" is the most advanced. It is already in daily use in many projection rooms throughout the country.

**\$275.00 per pair**

**WEBER MACHINE CORP.**

59 RUTTER ST., ROCHESTER, N. Y.

Export Dept., 15 Laight St., N. Y. C. Cable, "Ariab," New York

**Stereoscopic Motion  
Pictures**

(Continued from page 16)

of Dr. Ives which projected two pictures to the screen through a sort of "grating" of parallel lines, each picture being slightly off register with the other instead of being exactly superimposed one upon the other. By wearing a pair of spectacles marked with gratings that corresponded to the "gratings" of the "left" and "right" picture respectively, the "left" screen picture was uncovered to the left eye only, and the right screen picture to the right eye only.

Another method used was that of polarized light, the left projected image being polarized in a plane 90 degrees from that in which the right image was polarized. By wearing glasses of the proper characteristics as regards their ability to pass light polarized in a certain plane, the image of the left and right picture was confined to the left and right eye respectively. These last two methods were operative as far as laboratory use was concerned but were not industrially practicable.

The time is ripe for a test of some practicable method of stereoscopy as applied to sound pictures for it hardly seems possible that the public will not respond heartily to a combination of good stereoscopic motion pictures coupled with good sound, with the future possibility of binaural sound projection being added to this combination.

**Future Possibilities**

That the present known methods of producing stereoscopic motion pictures do not constitute all the possibilities in that direction cannot well be disputed. At any time some investigator working on this subject may devise a system which works perfectly, by finding that there is some characteristic difference between the operation of the left and right eye in all persons and building a system that takes advantage of that fact.

In illustration of this possibility it might be found upon investigation that all persons have a slight astigmatism in the horizontal plane in one eye and in the vertical plane in the other eye. If such a supposition proved to be the case it is easy to see how two superimposed images on a screen, one of which was distorted in one plane and one in the other plane would react upon the eyes so that one image would be better seen by the left eye and the other by the right eye. This result would most certainly produce stereoscopic effect in some measure.

Another idea that might be further investigated is that of a vertically corrugated screen with a pair of images thrown on it in superimposition from projection lenses placed several



inches apart. An idea of such a screen is given in Figure 3 where B represents the appearance of the screen as viewed from the audience and A shows the top edge appearance of the same screen. At C is shown the top edge view of the screen with the two small circles representing projection lenses each of which projects one series of pictures of a stereoscopic pair of series, lens L projecting the "left" pictures while lens R projects the "right".

It is seen that the greatest part of the picture projected by the R lens will strike on the left side of the corrugated flutes as represented by the lines which run from the R lens to the screen and the greater part of the picture projected by the L lens will strike on the "right" side of the flutes as represented by the lines travelling from the "left" lens to the screen. The reason this is so is because the lenses are separated a certain distance and therefore throw their light rays to the screen at different angles.

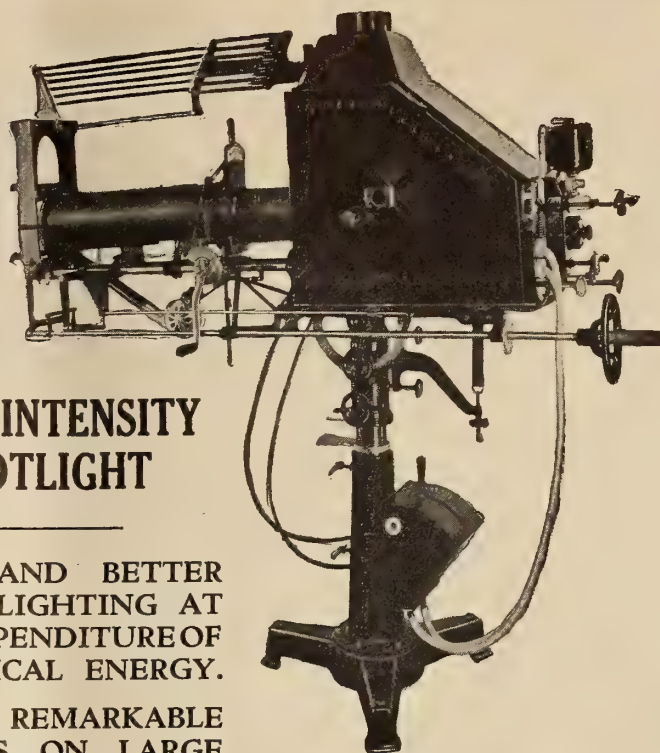
Assuming now that an observer is seated in the audience below and whose eyes have the same separation as the projector lenses above, it follows that his right eye will see the right sides of the flutes and his left eye will obtain a better view of the left side of each flute. This means that the "right" eye sees the R picture and the "left" eye the L picture which is the condition needed to bring about stereoscopic vision. The best result in this method is bound to be obtained with the observer in the center of the audience or directly under the projector, the effect being less conspicuous as the observer moves toward either side of the house.

There are, of course, many obstacles to be overcome in this method, the idea being advanced merely to accentuate the fact that it is necessary to follow true stereoscopic principles in any attempt to produce third-dimension effect, but that there are probably many yet undiscovered methods of projecting stereoscopic motion pictures that are practicable and not too complicated. When one of these methods is put into use in sound pictures we may rightly expect increased interest and attendance from the motion picture public.

### Outline of Sound Recording

(Continued from page 27)

rents will flow which may be of audible frequency. If there are loud speakers in the circuit, the presence of currents of such frequencies are easily recognized by the howl they produce. If above audible frequency, the currents will not be heard but will overload the circuit and tubes so that distortion is introduced just as if the amplifiers were inadequate to



## HIGH INTENSITY SPOTLIGHT

**MORE AND BETTER  
STAGE LIGHTING AT  
LESSEXPENDITURE OF  
ELECTRICAL ENERGY.**

**MOST REMARKABLE  
RESULTS ON LARGE  
STAGE SETS.**

**HALL & CONNOLLY, INC.**

24 Van Dam St.

New York, N. Y.



## SUPER-LITE LENSES

**WISELY CHOSEN BY  
AMERICA'S BEST THEATRES**

### New Bifocal Super-Lite Lens

An adjustable focus lens with a wide range of foci for both silent and sound film.

### Series III. Super-Lite Lens

Standard full Half-Size lens furnished in short focus as low as 4" E. F. and up to 10" E. F.

### Series IV. Super-Lite Lens

Full 3" diameter lens to meet the demand for more light for longer throws. 6" E. F. to 10" E. F.

*Quality Guaranteed*

**PROJECTION OPTICS CO., INC.**

330 Lyell Avenue

ROCHESTER, N. Y.

U. S. A.





## Good Projection Requires Good Rectification



M. P. 25-25

### Good Rectification Means

## FOREST RECTIFIERS

THIS Forest Rectifier meets the demand for a single unit to supply direct current for two projectors, and will furnish 15 to 25 amperes to either projector continuously.

It supplies a steady direct current, free from pulsations, and will produce a better light than other current supply devices. The only wearing parts are the bulbs which will last at least one thousand hours and usually much longer since only two bulbs are being used at a time (except during change over) and the load is alternately carried first by one set of two tubes then the other two as the projectors are alternately used.

This Forest Rectifier embodies the use of four rectifier tubes which are connected to supply current to two direct current circuits independent of each other, thus preventing loss of current at the first arc when the second arc is struck.

Both arc can be operated at the same time during the change over period and there will be no diminishing of the light from one projector while lighting up the second.

Two Ammeters are mounted on the unit which will show at a glance the amperage being used at either arc.

Links are provided for operating from 110-220 or 240 volts.

Rectifiers for all purposes made in 15 amp., 25-25 amps., 30, and 65 amps. sizes.

We are specialists in our field. Send us your technical problems. Literature on request.

## FOREST ELECTRIC CORP.

New and Wilsey Sts.

Newark

N. J.

carry the current which must flow through them. It will easily be recognized that with the amplification necessary in the recording circuit, it will take only a small amount of "feed back" to cause trouble. It is, therefore, necessary to carefully shield all the wiring of the circuit and to carefully twist all pairs so that there are no open loops.

The shielding is done by covering all pairs and single wires by a lead sheath or, in some cases, by braided copper. The long cables, which are used to connect the amplifier on the stage with the rest of the equipment, are shielded in this way and, in addition, a mechanical protection of flexible rubber is used to cover up the shield. It may be interesting to note that shielding is unsatisfactory unless it is all carefully connected to a single point, which is known as a "ground".

Referring again to Figure 5, it will be seen that in addition to the main amplifier, there is provided a separate bridging amplifier for each recording circuit and the necessary amplifiers for operating the monitoring and playback receivers. All these amplifiers are mounted in the amplifier room. In large studios, it is the practice to group the amplifiers for several channels in one amplifier room. (A channel consists of all the recording equipment used with a single stage.) This much simplifies the power supply as well as the operation and maintenance of this equipment. Such a group is shown in Figure 7.

On the amplifier racks there is also placed the volume indicator panel which operates the volume indicator meter, by which the monitor is able to judge the loudness of the noise being recorded. In appearance the volume indicator panel looks very much like a small amplifier, since it is furnished with a single vacuum tube and a dial. Actually, the tube acts as a rectifier and the dial controls the proportion of the received current going to the meter placed in front of the monitor.

This meter, is in appearance, very similar to the small ammeters on the dash-board of an automobile and is marked in arbitrary divisions to enable the monitor to judge the size of the swings of the needle, as well as their frequency. Since voice currents are by no means steady, even when rectified, the deflection of the meter is also rather irregular, and the monitor must judge by its swings, both in size and number, as to the size of the current flowing in the recording circuits. A similar meter is also mounted on the panel so that the amplifier man can be able to follow the operation of the equipment.

For reasons which will appear when we discuss the operation of the recorders, the volume indicator panel is connected to the bridging bus at the same point as the bridging amplifiers. (To be continued)

## Index of Advertisers

Amplion Products Corp.....	36
Amusement Supply Co. ....	35
Beaded Screen Corp.....	36
Best Devices Co.....	37
Blue Seal Products Co.....	34
Brenkert Lt. Project. Co.....	8
Chalmers Publishing Co.....	35
Eastman Kodak Co. ....	9
Electrical Research Products, Inc. ....	7
Fish-Schurman Corp. ....	9
Forest Electric Corp.....	42
General Machine Co.....	38
G-M Laboratories, Inc.....	35
Griswold Machine Works.....	38
Hall & Connolly, Inc.....	41
Hertner Electric Co. ....	5
Hoffman-Soons, Inc. ....	39
Ilex Optical Co.....	Front Cover
International Projector Corp., Back Cover	
Kaplan, Sam, Mfg. & Supply Co. 2	
Keasbey & Mattison Co.....	34
Mellaphone Corp. ....	36
Movie Supply Co. ....	42
National Carbon Co.....	4
National Theatre Supply Co....	43
Projection Optics Co. ....	41
Radiovisor Foreign & Colonial, Ltd. ....	39
RCA Protophone, Inc. ....	3
Rice, J. M., & Co.....	35
Roth Bros. & Co.....	10
Service-On-Sound Corp. ....	40
Strong Electric Corp. ....	37
Universal Elec. Welding Co.....	36
Weber Machine Corp.....	40
White Engineering Corp.....	6

**THEATRE EQUIPMENT**  
NEW AND USED

Sound Equipment, Moving Picture Machines, Screens, Booths, Opera Chairs, Spotlights, Stereopticons, Film Cabinets, Portable Projectors, M. P. Cameras, Generator Sets, Reflecting Arc Lamps, Carbons, Tickets, Mazda Lamps and Supplies.

Projection Machines repaired and overhauled. Repair parts for all makes opera chairs. Attractive 3 x 10 ft. muslin banners, \$1.50; on paper, 50 cents.

**We Pay Highest Prices for Used Projection Machines, Opera Chairs, etc.**

Everything for the Theatre—Write for Catalog K.

**MOVIE SUPPLY CO., 844 So. Wabash, Chicago**



---

# IF

# IT'S WORTH BUYING YOU CAN BUY IT BETTER AT NATIONAL

If it isn't a worthy product and a good value at its price you won't find it in the National Line, because National Theatre Supply Company insists on a high standard of quality value before it places any commodity at the disposal of its customers . . . It is a common practise at National to try out the efficiency of new products by making an exhaustive "customer test" before the commodity is officially added to the line. If after the trial period, it is not, in the opinion of customer users, a "good buy" at its price, it is simply passed up. . . . Many projectionists are allowed to judge the merits of new projection equipment and accessories before they become National Products, and they must also pass the rigid inspection and tests of National engineers. Due to the extreme precautions taken to safeguard the interests of its customers, National Service enjoys the nation-wide confidence of projectionists and theatre-owners alike.

Look for this emblem in the advertisements of manufacturers whose products are distributed and serviced through National. It is the identification mark of a Reliable Product and a Better Value.



---

**NATIONAL THEATRE  
SUPPLY COMPANY**  
*Branches in all Principal Cities*

---



# MANAGER'S RESPONSIBILITY FOR POOR PROJECTION

The theatre manager may not be responsible for the theatre site, for the quality of productions booked, for the equipment and decoration of the house, but projection is something for which he is responsible. There are instances where managers spend time complaining about the quality of photoplays available, when the projection at their theatres is so defective that discriminating patrons would avoid the theatre no matter what was on the program. Good projection is demanded today from everyone. Defective projection can make satisfactory entertainment impossible. Poor projection has put theatres out of business. Careless maintenance of equipment is the cause of many wasted dollars.

JOHN F. BARRY,  
Director of Personnel,  
Publix Paramount Theatres

# REPLACE WITH *Simplex* PROJECTORS

INTERNATIONAL PROJECTOR CORPORATION  
90 GOLD STREET  
NEW YORK

# REPAIR WITH GENUINE *Simplex* PARTS

## HARM DONE BY POOR PROJECTION

It will be a happy day for the motion picture industry when all the theatre owners and managers realize that if they want a rock-steady picture they must expect to have the Intermittent Movement parts replaced before they show appreciable wear. An undercut sprocket tooth not only makes for unsteadiness of the picture, but also is very hard on the delicate edge of the sprocket holes themselves. This means that the film is unnecessarily damaged and replacement by new prints is required much sooner than should be necessary. This, of course, adds to the overhead of the industry which in the end must be paid out of box-office receipts.

F. H. RICHARDSON,  
Editor, Projection Department,  
Motion Picture Herald















LIBRARY OF CONGRESS



0 007 552 328 2